The Trend of Regional Income Disparity in the People's Republic of China

Shantong Li
Zhaoyuan Xu

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Shantong Li was a visiting fellow at the Asian Development Bank Institute from July–October 2007. She is also senior research fellow at the Development Research Center of the State Council, People's Republic of China. Zhaoyuan Xu is an assistant research fellow at the Development Research Center of the State Council, PRC. The authors thank ADBI for its support and Mario B. Lamberte, Douglas Brooks, and Patricia Decker for their valuable comments and suggestions.

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Asian Development Bank Institute
Kasumigaseki Building 8F
3-2-5 Kasumigaseki, Chiyoda-ku
Tokyo 100-6008, Japan

Tel: +81-3-3593-5500
Fax: +81-3-3593-5571
URL: www.adbi.org
E-mail: info@adbi.org

Abstract

Based on recent updated statistical data that has become available since the People's Republic of China (PRC) implemented its first national economic census in 2004, this paper studies the trend of regional disparity both among and within the provinces of the PRC from 1978 to 2005. We find that compared with the 1990s, the expansive trend of inter-provincial disparities has slowed down and started to decrease somewhat since 2000. In 2004 and 2005, some statistical indicators, such as per capita GDP and per capita household consumption at current prices, show that regional disparities have declined to a certain extent. In addition to the great disparity among provinces, disparities within provinces are also very common in the PRC. Judged by some measurement indexes, income disparities within many provinces have even exceeded inter-provincial disparities.

The results of decomposing the regional disparity into within-group and between-group components suggested that the urban-rural disparities are the main source of regional disparities. The results further suggested that disparities among the PRC's four regions, especially between the eastern region and the other regions, are mainly to blame for inter-provincial disparities.

Finally, this paper finds that changes in regional disparities in recent years can be attributed to many factors, including policies and regional specific factors as well as some cyclical factors. For this reason, we still cannot claim that the PRC's regional disparities have started a decline that will continue.

JEL Classification: O18, R12, O47

Contents

INTRODUCTION

Since the late 1970s, as the People's Republic of China (PRC) has opened to the outside world and reformed its economic system—and especially as it has implemented a tax sharing policy between the central and provincial governments—various of its regions have achieved high economic growth rates, gained more autonomous power in decision making and more initiative in economic development, and experienced a significant improvement in living standards. Even Guizhou province, with the lowest GDP per capita, has experienced an eleven-fold increase in economic output from 1978 to 2005, with the annual economic growth rate averaging 9.5% at constant prices. GDP per capita increased from 175 yuan in 1978 to 5,052 yuan in 2005; this is nearly eight-fold growth with an average annual growth rate of 8.6% at constant prices.

However, the PRC is a large developing country with a huge population and a tremendous amount of territory. Among the regions, the natural endowments as well as economic and social conditions differ greatly. These differences predispose the PRC to having regional imbalances. This regional disparity is one of the crucial issues faced by the PRC in its medium- and long-term development. It is also a core problem that the PRC must solve to achieve coordinated regional development. In-depth study of the regional income disparity in the PRC is necessary for this effort.

In the 1990s, continuously growing regional disparity raised concern among the government and society. Many scholars undertook rigorous study of various aspects of the regional disparity. Most of these studies focused on the problems of disparity among provinces; relatively little systematic study has investigated disparity within each province.

The PRC's provinces are large and populous. Seven of its provinces or autonomous regions have land areas that exceed 400 thousand square kilometers; nine of its provinces have populations over 50 million, and three of those provinces' populations exceed 90 million. Because the provinces cover such expansive areas and contain such large populations, a variety of differing conditions exist within each province. Therefore, study that focuses only on the issue of disparity among provinces cannot accurately reflect the situation of regional disparity in the PRC.

The unique feature of this paper is that it includes analysis of regional disparity not only among the provinces of the PRC, but also within them. The analysis is based on recent updated statistical data that has become available since the PRC implemented its first national economic census in 2004. The regions adjusted their historical economic data in accordance with the result of this national economic census, these adjusted data reflect the region's economic conditions more precisely.

SURVEY OF LITERATURE RELATED TO REGIONAL DISPARITY IN THE PRC

Many studies have examined the trends of change in inequality among the PRC's regions. Most of these studies found that regional disparity measured in terms of GDP per capita declined significantly from 1978 to 1990, the first stage of the PRC's reform and opening (Jian, Sachs, and Warner, 1996; Lin and Liu, 2003; Dayal-Gulati and Husain, 2000; Li, Feng, and Hou, 2004). Many of these studies recognized that the decline in regional disparity was due mainly to the character of the rural reform in this stage. The reform heavily promoted the growth of agricultural production, so the underdeveloped rural areas—which initially had per capita outputs lower than the national average—benefited highly from the reform.

However, a trend of continuous regional disparity has emerged since the 1990s (Wang and Fan, 2004; Kanbur and Zhang, 2005). This is mainly due to the increase of disparity between

the coastal area and provinces in the inland. Wu (2004) studied the impact on regional disparity of three centrally administered municipalities: Beijing, Tianjin, and Shanghai. He discovered that regional disparity in the PRC is reduced greatly if the data of these three centrally administered municipalities are excluded. Due to the unique features of these three municipalities, it is meaningless to compare the data of these three municipalities with that of other provinces in the PRC. Therefore, incorrect results will be obtained if these three municipalities are studied together with other provinces. More recently, Xu and Li (2006) discovered that although the PRC's regional disparity has risen continuously since 1990, the rate of this increase has declined since the year 2000.

Some studies have found that the PRC's urban-rural disparities constitute the main part of the overall disparities. Using urban and rural household consumption data of 28 provinces exclusive of Beijing, Tianjin, and Shanghai between 1983 and 1995, Kanbur and Zhang (1999) found that urban-rural disparities accounted for 70% of the overall regional disparities. Yang and Zhou (1999) also provide some evidence of widening urban-rural income disparities. Some other studies have discovered that disparities between coastal and inland regions or among eastern, central, and western regions have been expanding rapidly since the PRC's reform and opening up. By decomposing the Gini coefficient, Yao and Zhang (2001) showed that the proportion accounted for by disparities among eastern, central, and western regions has risen to nearly 80% since 1990. Wang and Zhang (2006) adopted the Theil_L index decomposition technique and also discovered that disparities among eastern, central, and western regions have grown continuously and represented about 77% of the overall disparities in the PRC in 2001.

Since its reform and opening up, geographic, institutional, and some other factors have played important roles in changes of the PRC's regional disparities. Wang (2004) found that township and village enterprises (TVEs), education, and capital investment were among important factors determining income disparities in rural areas. Wang and Fan (2004) discovered that FDI, governmental transfer payment, and labor migration have affected the changing of the PRC's regional disparities. Peng (2005) examined the regional divergence of growth in the PRC from the perspective of sectors (such as agriculture, industry, construction, transport and post and other tertiary industries) from 1990 to 2002 and found large heterogeneity in productivity levels and movements across sectors and provinces. Decomposing aggregate divergence into within and between sector components revealed that the secondary and tertiary industrial sectors contributed to 87% of the total divergence. Kanbur and Zhang (2005) showed that regional disparities can be explained by three key policy variables: the ratio of heavy industry to gross output value, the degree of decentralization, and the degree of openness. Some other studies (Litwack and Qian, 1998; Young, 2000; Demurger, 2001; Demurger et al., 2002; Yang, 2002; Renard, 2002) have found that factors including the PRC's regional development strategies, preferential policies in favor of cities, SOE reform, fiscal decentralization, and public infrastructure all contribute to the expansion of regional disparities. Li, Feng, and Hou (2004) and Poncet (2005) also investigated the PRC's regional protectionism and market integration. Young (2000) showed that market segmentation has aggravated the growing trend of regional disparities because the lack of a uniform market has a weaker negative impact on coastal areas than on their inland counterparts.

INDEXES MEASURING REGIONAL INCOME

Many indicators can reflect regional income. The following three are usually adopted to measure the PRC's regional disparities.

(1) ***Per capita GDP***. Per capita GDP is the most frequently used index. It reflects one region's production capacity, income, and economic development level. Compared with

other indexes, statistics on per capita GDP are relatively complete and perfect.[1] However, this index alone cannot fully capture the welfare enjoyed by people in one region because this welfare is directly determined by a combination of many other factors including household incomes, regional prices, and public services. Although household incomes are closely related to per capita GDP, the two are not completely consistent due to transfers of factor incomes and transfer payments among regions.

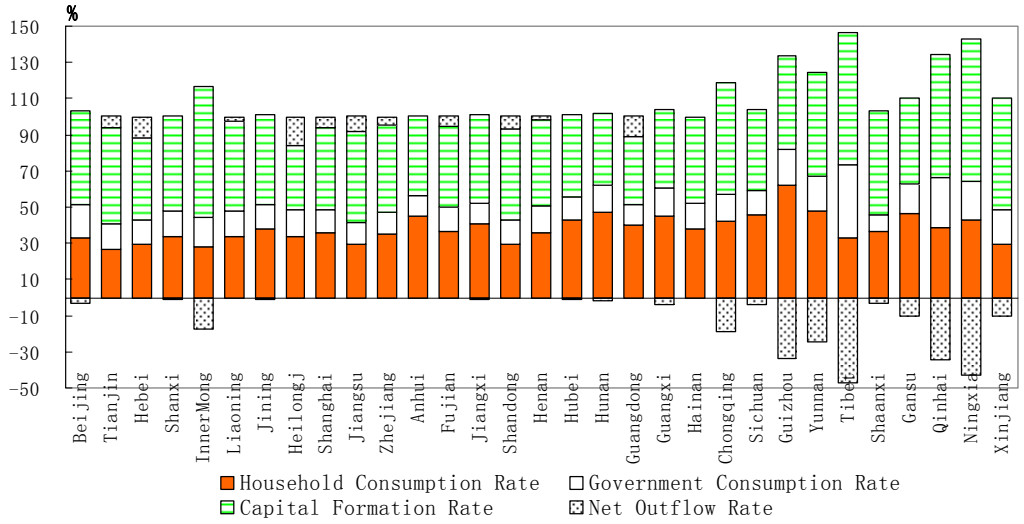
(2) ***Per capita consumption (household consumption level)***. Compared with per capita GDP, per capita consumption can better reflect household living conditions. GDP expenditure is composed of capital formation, consumption, and net export, while consumption can be further decomposed into governmental and household consumption. The shares of capital formation, consumption, and net export may be different in different regions, and so are proportions of government and household consumption. For example, all provinces in the western region have net inflows while most provinces in the eastern region (except Beijing) have net outflows because there are some transfer payments between the central government and provincial governments, and the existence of large transfer payments from more developed to less developed regions. Therefore, household consumption level is the most direct measurement of household living standards.

(3) ***Household income***. Household income is the main determinant of household living standards and quality of life. This index can directly reflect the welfare enjoyed by households. In the PRC, household income is measured by urban per capita disposable income and rural per capita net income. The data of household income directly come from household survey statistics produced by survey teams of the National Bureau of Statistics.

Per capita GDP, household income, and per capita consumption reflect regional income level and household welfare level in different ways, so regional disparities based on calculations of these three indexes are somewhat different. There are great differences in consumption rates among different regions. For example, the per capita GDP of Zhejiang (27,703 yuan) was 5.48 times that of Guizhou (5,052 yuan) in 2005, while the share of household consumption in GDP was 35% for Zhejiang and 62.1% for Guizhou (see Figure 1). The household consumption level of Zhejiang was 3.09 times that of Guizhou, indicating that the regional disparity measured by consumption per capita is significantly less than that measured by per capita GDP. On the whole, the household consumption rate in the more developed eastern regions (an average of 33.2% in 2005) is relatively low while the index is relatively high in other regions (an average of 40.4% in 2005). Therefore, it can be safely concluded that regional disparity based on per capita consumption is less than that based on per capita GDP.

[1] For example, many other indexes such as household consumption level and household income are not available at the prefecture or county level.

Figure 1. PRC's Regional GDP Calculated with Expenditure Approach in 2005



Source: *China Statistical Yearbook 2006*

There is also some difference between regional disparities measured by household income and those by household consumption per capita. Calculations using the latter can produce lower results than the former because of the low marginal propensity to consume for households with higher incomes. However, there is some variation between local household consumption level and actual consumption level in large cities like Beijing and Shanghai because statistics on the PRC's household consumption per capita come from the national income account, which reflects households' purchases of goods and services. In these large cities, purchases made by citizens from other regions account for a considerable proportion of total retail sales of consumer goods and services.

Because there are some differences among results calculated using the three indexes, an integrated analysis should be conducted to include all these indexes and reflect regional disparities in a comprehensive manner. However, due to limitations in the data availability, we have chosen to use per capita GDP, household income, and household consumption per capita for measuring regional disparities at the provincial level, and use only per capita GDP for the prefecture and county levels.

REGIONAL DISPARITIES AMONG THE FOUR REGIONS IN THE PRC

Great differences exist in terms of geography, resources, economic and social development, and culture between the PRC's coastal and inland regions. Since 1986 (the beginning of the Seventh Five-Year Plan) many studies have revealed obvious disparities among the eastern, central, and western regions in the PRC. In this paper we first analyze disparities among the four regions differentiated in the Eleventh Five-Year Plan.[2] The eastern region is more developed, with less than 9.6% of the nation's total area, more than 30% of the nation's total population, and over 40% of the total output. Table 1 shows the shares of population and GDP of the four regions.

As shown in Table 1, the share of output of the eastern region has risen from 43.8% in 1980 to 55.6% in 2005, with an increase of 11.8 percentage points over 25 years. Accordingly, the shares of output of other regions have declined somewhat since the PRC's reform and the opening up of its economy. From 1978 to 2005, the share of GDP of the central region

[2] Appendix A presents the Chinese administrative system and illustrates the division of the PRC's regions.

dropped by 3.5 percentage points, while the shares of the western and northeastern regions shrank by 3.3 and 5 percentage points, respectively.

Table 1. Shares of GDP and Population of Eastern, Central, Western, and Northeastern Regions (%)

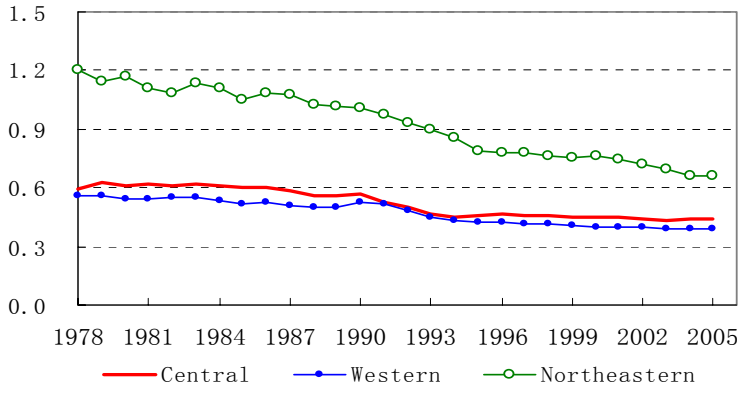
	1980		1990		2000		2005	
	GDP	Population	GDP	Population	GDP	Population	GDP	Population
Eastern	43.8	33.9	45.9	34.1	53.5	35.1	55.6	35.8
Central	22.3	28.3	21.8	28.5	19.2	28.1	18.8	27.5
Western	20.2	28.7	20.3	28.5	17.3	28.3	16.9	28.2
Northeastern	13.7	9.1	11.9	8.8	9.9	8.6	8.7	8.4
Total	100	100	100	100	100	100	100	100

Sources: *Provincial Statistical Yearbook 2006* (31 provinces).

The proportion of population of the eastern region increased from 33.9% in 1980 to 35.8% in 2005, while the proportions of the other three regions declined by 0.5 to 0.8 percentage points. The population growth rate of the eastern region is higher mainly because of population migration across regions. But the increase in the share of population of the eastern region has been much smaller than the increase in its share of GDP, indicating that labor movement across regions is relatively slow.

Figure 2 shows that per capita GDP in the northeastern region was higher than that of the eastern region in the late 1970s. The ratio of per capita GDP in the northeastern region to that in the eastern region declined from 1.2 in 1978 to 1 in 1990; and the ratios of per capita GDP in the central and western regions to the eastern region also declined, but on a smaller scale, from 0.627 and 0.563 in 1978 to 0.567 and 0.529 in 1990, respectively. In the 1990s the gap between the eastern region and the other regions increased. The ratios of per capita GDP of the northeastern, central, and western regions to the eastern region in 1991 were 0.97, 0.52, and 0.51, respectively, and they decreased to 0.76, 0.45, and 0.40, respectively, in 2000. After 2000, the changes in these ratios were smaller than they were in the 1990s. In 2005 the ratios of per capita GDP of the northeastern, central, and western regions to the eastern region were 0.66, 0.44, and 0.39, respectively. Compared with 2000, the ratios of the central and western regions have been stable in recent years.

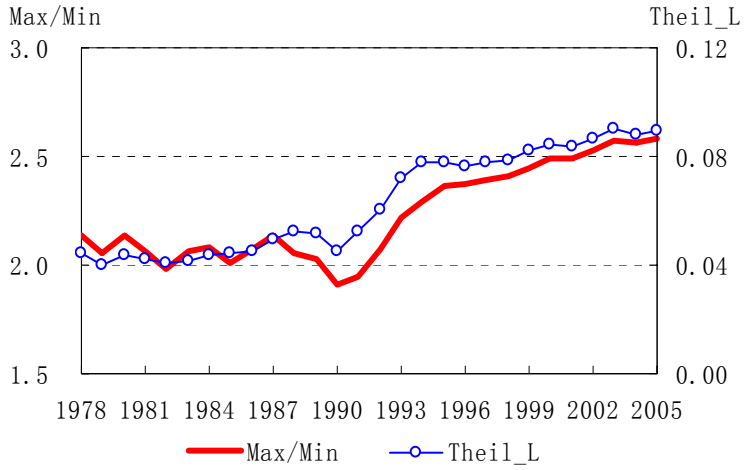
Figure 2. Comparison of Per Capita GDP in the Four Regions (Eastern Region =1)



Source: *Provincial Statistical Yearbook 2006* (31 provinces).

Figure 3 depicts changes in the ratio of maximum to minimum values of per capita GDP of the four regions. In 1978, the ratio of maximum to minimum value of per capita GDP was 2.14. There were almost no changes in the ratio in the 1980s and it reached its lowest point of 1.91 in 1990. But the ratio has been on the rise since 1990 and reached 2.58 in 2005, with per capita GDP of 24,024 yuan for the eastern region. In sum, disparities among the four regions measured in terms of changes in the ratio of maximum to minimum value of per capita GDP have been rising since the reform and opening up of the economy. However, the ratios of maximum to minimum value of per capita GDP were 2.57 and 2.58 in 2004 and 2005 respectively, suggesting that that the income disparity among the four regions has stabilized. Results of the Theil index show similar trends (see Figure 3).

Figure 3. Income Disparity in the Four Regions (By Per Capita GDP at Current Price)

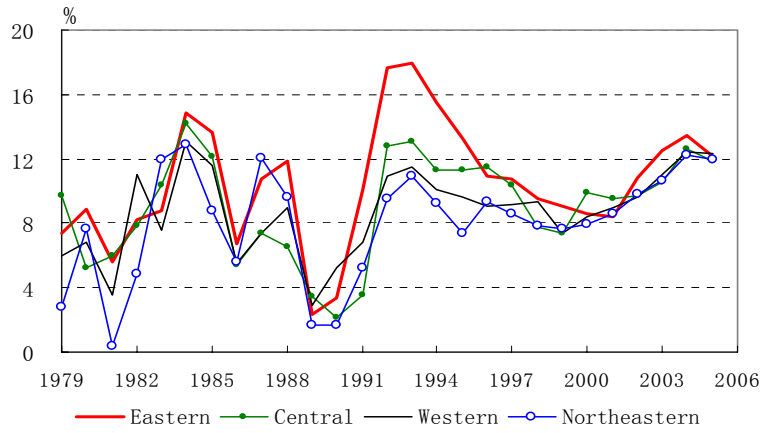


Source: Authors' calculations.

In the 1980s, the growth rates in per capita GDP of the four regions differed little, with the eastern region experiencing a slightly higher growth rate. Beginning in 1990, however, the per capita GDP growth rate of the eastern region accelerated. Especially in the early part of the 1990s its growth rate was much higher than those of the central, western, and northeastern regions. For example, the growth rates of per capita GDP in the eastern, central, western, and northeastern regions were 13.69%, 10.53%, 9.59%, and 8.59% respectively from 1990 to 1997; the growth rate in the eastern region was 3.1–5.1 percentage points higher than those in the other regions. After 2000, the eastern region maintained a higher growth rate, but the difference between it and the other regions has narrowed. The growth rates of per capita GDP in the eastern, central, western, and northeastern regions were 11.48%, 10.86%, 10.89%, and 10.64% respectively from 2000 to 2005; the differences were only 0.6–0.8 percentage point. As a result the income disparity among the four regions remains stable.

In short, there was declining regional disparity among the four regions of the PRC in the 1980s, which was mainly due to the continuous decline of regional disparity between the northeastern and eastern regions. In the 1990s, especially in the first half of the 1990s, there was a significant widening of the gap among the four regions. This was mainly due to the extraordinarily high economic growth rate of the eastern region compared to the other regions. Since 2000, although there is still growth of the disparities among the four regions, the rate of increase has become relatively smooth. Disparities in per capita GDP among the four regions were stable in 2003, 2004, and 2005.

Figure 4. Growth Rate of Per Capita GDP in the Four Regions (1979–2005)



Source: authors' calculations.

INTER-PROVINCIAL DISPARITIES IN THE PRC

In the PRC's administrative system, provincial level is very important Many studies have focused on regional income disparity in the PRC based on provincial data, and most of these studies have been based on the data that existed before the PRC implemented its first national economic census in 2004. For example, in 2004 GDP was considered to be 1.369 trillion yuan before the census, and was adjusted to 1.599 trillion based on the results of the census. The adjusted GDP was 17.8% higher than the non-adjusted figure. All regions made adjustments to their historical economic data in accordance with the result of this national economic census. For example, in 2004 GDP in Beijing, Shanxi, and Guangdong were adjusted upward by 41.5%, 17.4%, and 17.4%, respectively, and that in Heilongjiang, Hubei, and Guangxi were adjusted downward by 10.4%, 4.8%, and 10.7%, respectively. The adjusted data reflect the economic conditions of the regions more accurately. In this paper, our analysis is based upon the adjusted data, which is based on the results of this national economic census.

A. Trend of Inter-provincial Income Disparity

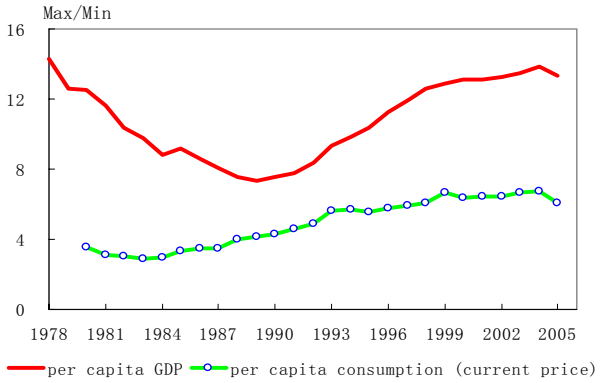
1. Changes in regional disparities measured by ratio of maximum to minimum values

The ratio of maximum to minimum values of income (Max/Min, or MMR) can describe regional disparities. We first conduct a simple analysis of regional disparities using this measure.[3]

At the beginning of the reform and opening up of the economy, regional disparities in the PRC were relatively large. In 1978, the per capita GDP of Shanghai was 2,497 yuan, almost 14.2 times that of Guizhou province, with the lowest per capita GDP. As indicated by Figure 5, the ratio of maximum to minimum per capita GDP decreased from 14.2 in 1978 to 7.3 in 1990, rose to 13.0 in 2000, and stayed relatively stable thereafter. But that has not been the case with per capita consumption. Inter-provincial disparities in terms of per capita consumption have been generally on the rise since the 1980s, but after 1999, the level remained very stable. In 2005, both the ratio of maximum to minimum per capita GDP and per capita consumption declined compared with those of the previous year.

[3] Appendix B presents the measures of regional disparities used in this paper.

Figure 5. Inter-provincial Disparities Measured by the Ratio of Maximum to Minimum Values (At Current Prices)



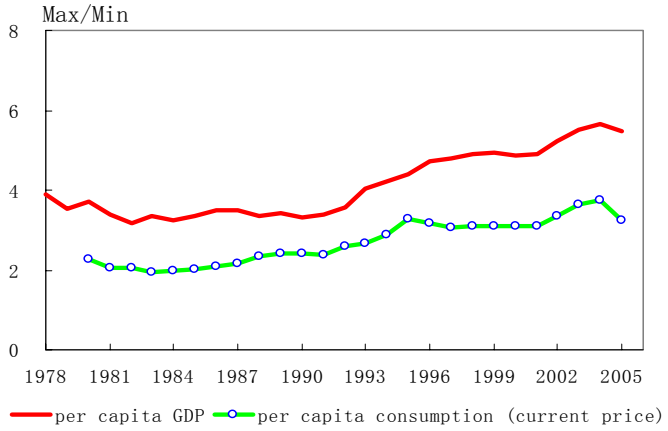
Source: *Provincial Statistical Yearbook 2006* (31 provinces).

The changing pattern of regional disparities will be slightly different if we exclude the three municipal cities of Beijing, Tianjin, and Shanghai. They are highly developed and have low proportions of rural population.[4] Thus, the three cities are not easily comparable with other provinces or autonomous regions. Data shown in Figure 6 do not include these three municipal cities. The ratio of maximum to minimum per capita GDP among the provinces, excluding the three municipalities mentioned, is smaller than that among all of the provinces. For example, the ratio of maximum to minimum per capita GDP among all of the provinces in 1978 was 14.3, and that among the provinces excluding these three municipal cities was 3.9, and in 2005 they were 13.4 and 5.5, respectively.

Figure 6 also depicts changes in the ratio of maximum to minimum values of per capita GDP among the provinces excluding the three municipalities. The data show that the trend of the change in regional disparities among the 28 provinces and autonomous regions (excluding the three centrally administrated municipalities) is similar to the regional disparities among the four regions. There has been a slight decline of regional disparity among the provinces and autonomous regions since the reform and opening up of the economy in the late 1970s up to 1990. The maximum to minimum ratio rose to 4.86 in 2000, reached the peak of 5.64 in 2004, and then declined in 2005. A similar trend is shown in the maximum to minimum ratio of per capita household consumption.

[4] Urbanization rates of Beijing, Tianjin, and Shanghai in 2005 were 82%, 73%, and 89%, respectively, while the average urbanization rate of the whole nation was only 43%, and their per capita GDP (2006) ranked second, third, and first in 31 provinces respectively.

Figure 6. Inter-provincial Disparities Measured by the Ratio of Maximum to Minimum Values (At Current Prices, Excluding Beijing, Tianjin, Shanghai)



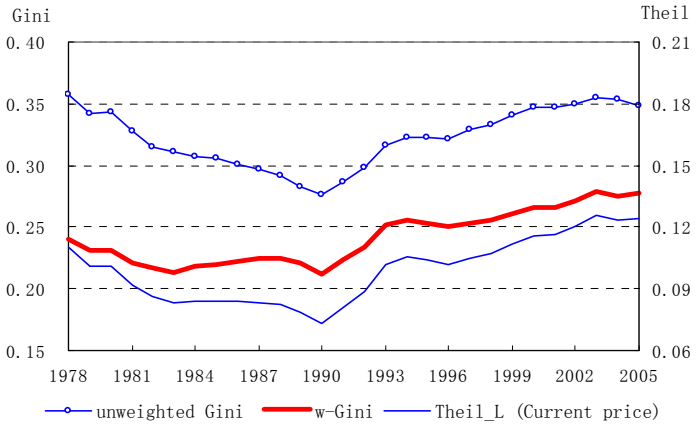
Source: *Provincial Statistical Yearbook 2006* (31 provinces).

2. Changes in inter-provincial disparities measured by Gini coefficient and Theil index

Although maximum and minimum values intuitively reflect changes in regional disparities, they cannot fully show inter-provincial disparities in terms of development level. Therefore, we will use both the Gini coefficient and the Theil index to supplement our analysis in this section.

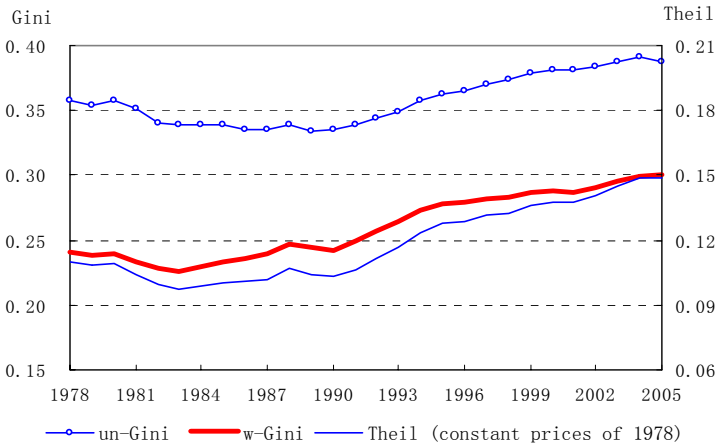
Figures 7 and 8 show inter-provincial disparities based on per capita GDP at current and constant prices (1978 = base year), respectively.

Figure 7. Gini Coefficient and Theil Index based on Per Capita GDP at Current Prices



Sources: Provincial Statistical Yearbook 2006 (31 provinces).

Figure 8. Gini Coefficient and Theil Index based on Per Capita GDP at Constant Prices of 1978



Sources: *Provincial Statistical Yearbook 2006* (31 provinces).

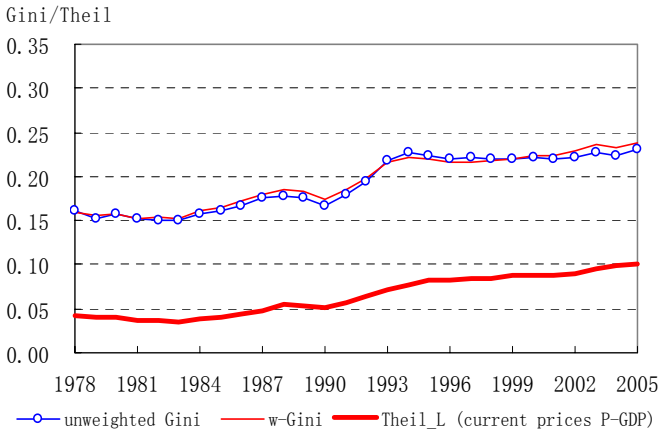
Regional disparities in terms of per capita GDP declined between 1978 and 1990. As shown in Figure 7, the unweighted Gini coefficients based on per capita GDP at current prices declined from 0.357 in 1978 to 0.276 in 1990—a decrease of 22.7%. In the same time period, there were declines of 12% and 33.4% for the weighted Gini coefficients and Theil index, respectively, based on per capita GDP. The results based on 1978 constant prices are quite similar, but the amount of decrease is smaller. The unweighted Gini coefficients and Theil index decreased by 6.1% and 6.3%, respectively, and the weighted Gini coefficients increased by 0.9%.

In the 1990s inter-provincial income disparity grew rapidly. The unweighted Gini coefficients based on per capita GDP at current prices increased from 0.276 in 1990 to 0.347 in 2000—an increase of 25.7% with an average annual growth rate of 2.3%. The weighted Gini coefficients and Theil index based on per capita GDP increased by 25.8% and 57.6%, respectively.

Compared with the 1990s, the widening of regional disparities in the PRC has gradually slowed down since 2000. The unweighted Gini coefficients based on per capita GDP at current prices increased from 0.347 in 2000 to 0.349 in 2005—a difference of only 0.5%. Compared with the previous year, this index as well as some other indexes decreased in 2004 and 2005.

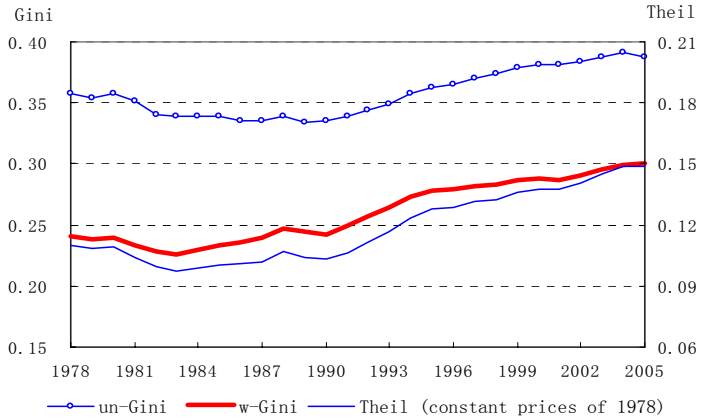
Figures 9 and 10 show changes in inter-provincial disparities in terms of per capita GDP, again exclusive of Beijing, Tianjin, and Shanghai, at current and constant prices (1978 = base year), respectively. The calculations excluding the three cities yield smaller disparities than calculations including all of the provinces. For example, the range of unweighted Gini coefficients based on per capita GDP at current prices among the 31 provinces is between 0.276 and 0.356, but that among the provinces excluding these three cities is between 0.15 and 0.231. The weighted Gini coefficient has risen by almost one half from 0.159 in 1978 to 0.238 in 2005. The unweighted Gini coefficient also shows a similar pattern. The Theil index has climbed from 0.041 in 1978 to 0.101 in 2005. The figures also reveal that the rising trend of inter-provincial disparities has slowed down since 1994.

Figure 9. Changes in Inter-provincial Disparities in terms of Per Capita GDP (at Current Prices) Exclusive of Beijing, Tianjin, and Shanghai



Source: *Provincial Statistical Yearbook 2006* (31 provinces).

Figure 10. Changes in Inter-provincial Disparities in terms of Per Capita GDP (at 1978 prices) Exclusive of Beijing, Tianjin, and Shanghai



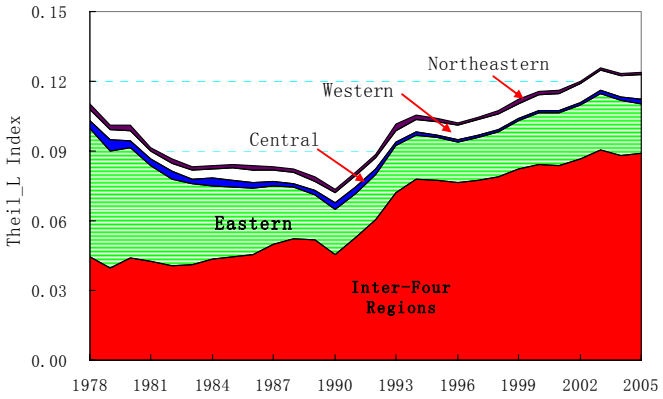
Source: *Provincial Statistical Yearbook 2006* (31 provinces).

Based on the results of the above statistical indexes, the change in disparities among the provinces of the PRC can be divided roughly into three periods: (i) a period of decreasing disparities among the provinces in the 1980s, (ii) a period of rapid increase in disparities among the provinces in the 1990s, especially in the first half of the 1990s, and (iii) a period of slowly increasing disparities since 2000, in which some indexes in 2004 and 2005 even reflect decreasing disparities. The income disparity among the 28 provinces and autonomous regions (excluding the three centrally administrated municipalities) is relatively small and the change is relatively stable. The Gini coefficient fluctuated between 0.22 and 0.23.

B. Spatial Decomposition of Inter-provincial Disparities

In order to explore the spatial distribution of inter-provincial disparities in the PRC, we will apply the group decomposition technique in the following analysis.

Figure 11. Decomposition of Inter-provincial Disparity among Four Regions based on Nominal Per Capita GDP



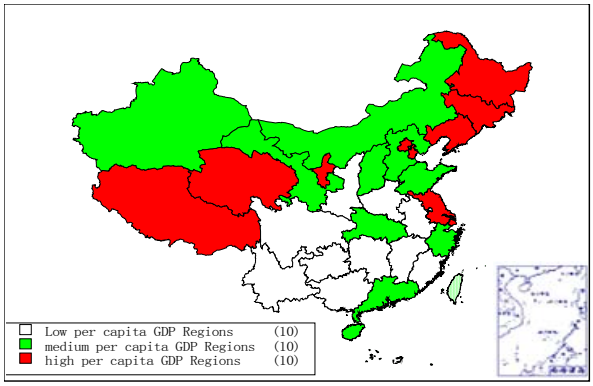
Source: Provincial Statistical Yearbook 2006 (31 provinces).

Figure 11 shows the decomposition result of regional disparity from 1978 to 2005.[5] If the Theil index of all the 31 provinces and autonomous regions is decomposed based upon the four regions, the share of disparity among the four regions as part of overall disparity rises from 40% in the initial period of reform and opening to 70% in recent years. The disparity among the provinces and autonomous regions is mainly caused by the disparity among the four regions. The disparity within the eastern region has a share around 20% of overall disparity, while in the rest of the PRC, the disparity within the western, central, and northeastern regions all together have only a share of 10% of overall disparity. Also, the decline in regional disparity of the PRC during the period 1978–1990 was mainly due to the significant decline of internal disparity within the eastern region. In 1978, the internal Theil index of the eastern region was 0.055, which constitutes a share of 49.8% of the national total Theil index (0.110). In 1990, the internal Theil index of the eastern region constituted a share of 26.6% of the national total—a decline of 23.2 percentage points. The absolute value of the national Theil index declined by 0.037, and the absolute value of the internal Theil index of the eastern region declined by 0.035, which makes for a share of 96% of the decline of the national Theil index. Therefore, it can be said that the change in eastern internal regional disparity can explain in large part the change of the regional disparity of the whole country.

Figures 12, 13, 14, and 15 show the distribution of the PRC's provinces and autonomous regions according to their level of development in terms of per capita GDP in 1978, 1990, 2000, and 2005, respectively. In 1978, there was large difference in the level of development in the eastern region. Among the ten provinces in this region, only Beijing, Tianjin, Shanghai municipalities and Jiangsu province had achieved relatively higher per capita GDP, while Zhejiang, Shandong, Hainan, and Fujian provinces were ranked in the medium and lower levels of per capita GDP of the PRC. Qinghai province ranked seventh in the PRC at that time.

[5] The decomposition method is described in part 3 of Appendix B

Figure 12. Economic Development Level of All Provinces in PRC in 1978

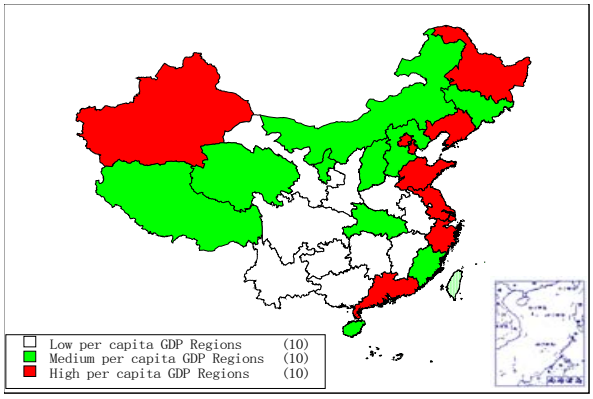


Note: Here we combine Sichuan and Chongqing to calculate per capita GDP. Our subsequent analysis also uses this approach.

Source: *Data of Gross Domestic Product of China: 1952-2004*

In 1990, there were significant increases in the ranks of Guangdong, Zhejiang, Shandong, Hainan, and Fujian provinces. Nearly all provinces in the eastern region achieved relatively higher per capita GDP except Hubei, Fujian, and Hainan. Therefore, internal disparity was reduced significantly. In 1990, Xinjiang province in the western region was ranked among the top ten in the PRC. Qinghai and Tibet were among the middle ten. In the year 2000, no province of the western region ranked in the top ten (see Figure 14), But Inner Mongolia, in the western region, entered the top ten in 2005.

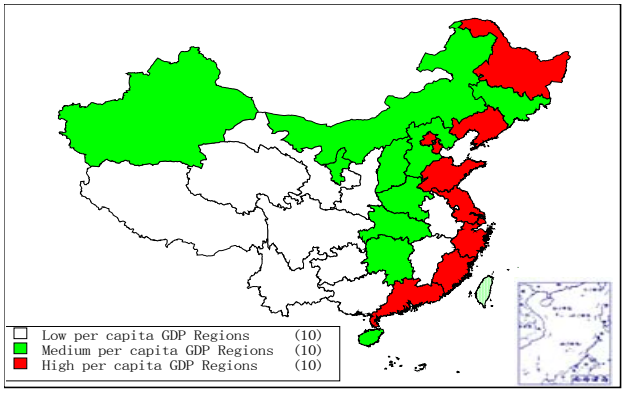
Figure 13. Economic Development Level of All Provinces in PRC in 1990



Source: *Data of Gross Domestic Product of China:1952-2004*

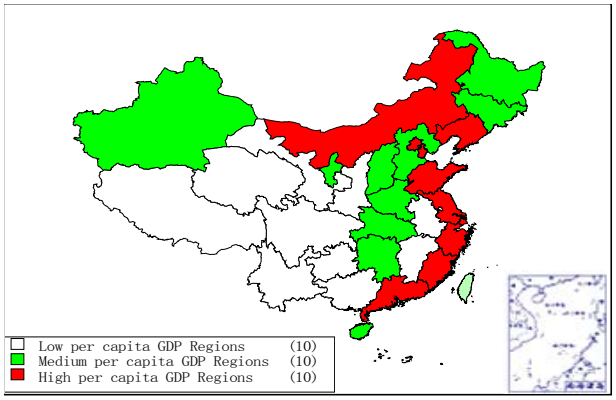
Since 1990, the continuous widening of disparities among the four regions is to blame for the expansion of regional disparities. During this period, the process of the PRC's reform and opening up of its economy have further advanced, the economic growth rates of the more developed eastern provinces have been higher than the nation's average level, and all the eastern provinces except Hebei and Hainan have become high per capita GDP regions (see Figure 14). Figure 14 also shows that not one province of the western region was in the top ten in 2000. Therefore, disparities between the eastern region and other regions have grown further. The internal disparities of the four regions have changed modestly from 1990 to 2005, but the between-group Theil index, reflecting disparities among the four regions, has increased by 0.044 from 0.045 in 1990 to 0.089 in 2005, which accounts for 86.3% of the change of the nation's Theil index (this index increased from 0.081 to 0.124).

Figure 14. Economic Development Level of All Provinces in PRC in 2000



Source: *Data of Gross Domestic Product of China:1952–2004.*

Figure 15. Economic Development Level of All Provinces in PRC in 2005



Source: *China Statistical Year Book 2006.*

Finally, the present inter-provincial disparities in the PRC are dominated by disparities among the four regions, especially disparities between the eastern region and the other three regions. Disparities among the four regions accounted for 71.8% of the total disparities in 2005. The share of internal disparities of the eastern region was 17.1%, and the share was 8.7% for internal disparities of the western region and 2.3% for internal disparities of both the central region and the northeastern region.

C. Factor Analysis of Regional Income Disparity

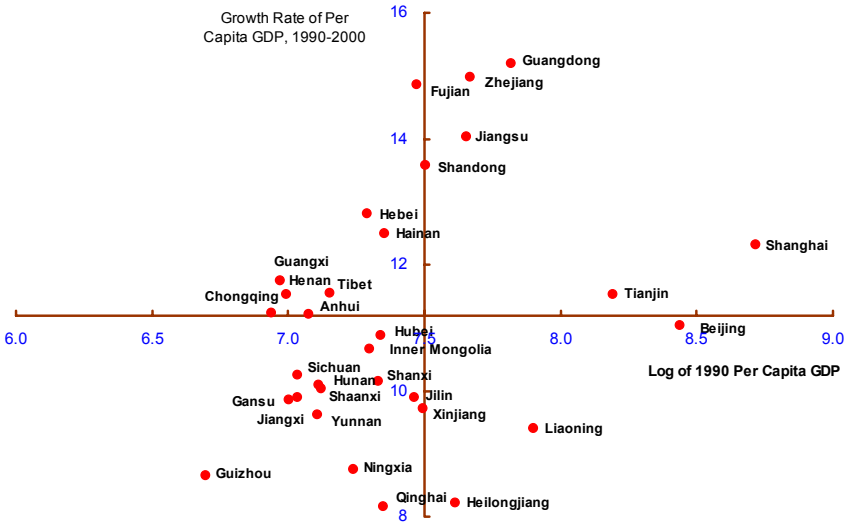
Changes in regional income disparity can be caused by differences in regional economic growth rates. If high-income provinces grow faster than the national average, the inter-regional income disparity can expand; if low-income provinces grow faster, the inter-regional income disparity will narrow.

1. Changes in patterns of regional growth and regional disparities

Figures 16 and 17 describe the regional growth patterns in 1990–2000 and 2000–2005, respectively. After the PRC began its reform and opening up, the average speed of development in the eastern region was higher than in the other regions because the coastal region had a favorable investment environment, an abundant supply of labor, and was opened to the outside world earlier than the rest of the country. This trend became more tangible after the 1990s. In Figure 16, many provinces of the eastern region are located in the upper-right part of the figure (with higher incomes and higher growth rates), while many

provinces of the western and central regions are located in the lower-left part (with lower incomes and lower growth rates). This resulted directly in widening regional disparities in the PRC in the 1980s.

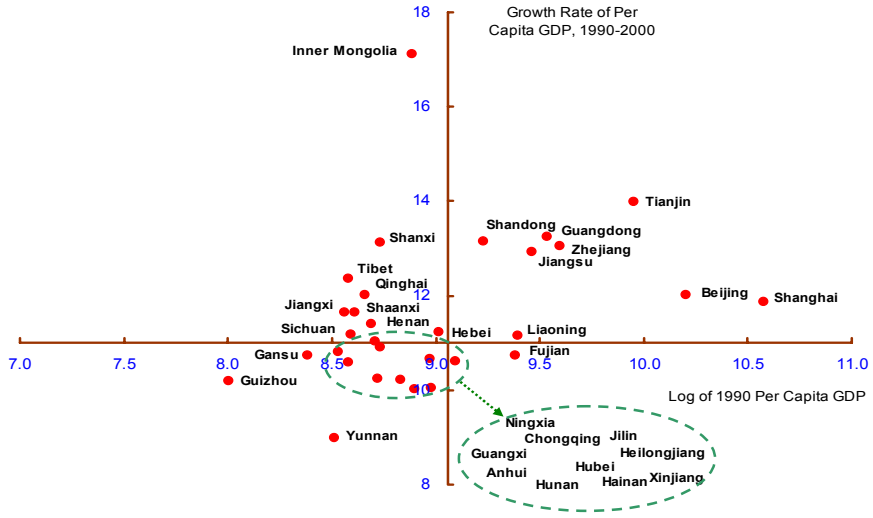
Figure 16. GDP Per Capita in 1990 and Growth Rate 1990–2000



Source: *Data of Gross Domestic Product of China:1952–2004.*

After 2000, however, economic growth in the PRC's less developed regions increased measurably. Not only did some low-income regions such as Inner Mongolia, Tibet, Qinghai, and Shanxi post growth rates higher than the national average, other regions whose per capita GDP was relatively low also saw a narrower gap between their growth rates and the national average level than in the 1990s. Comparing Figures 16 and 17, we can find that the number of provinces located in the lower-left part of the figure (with lower incomes and lower growth rates) decreased, and number of provinces located in upper-left part (with lower incomes and higher growth rates) increased. As a result, the widening of regional disparities in the PRC has gradually slowed down since 2000.

Figure 17. GDP Per Capita in 2000 and Growth Rate 2000–2005



Source: *Provincial Statistical Yearbook 2006* (31 provinces).

A comparison between the GDP growth rates of the regions in 2003–2005 and the average growth rates during the 1990s can more clearly indicate changes in patterns of regional economic growth in the PRC. As indicated in Table 2, five provinces saw lower growth rates in 2003–2005 when compared with the average growth rates in the 1990s. Except for Hubei, all of these provinces had per capita GDP levels higher than the national average. The other 26 provinces and municipalities saw higher growth rates in 2003–2005 than in the 1990s. In particular, Tianjin, Shanxi, Jiangxi, Liaoning, Heilongjiang, Inner Mongolia, Shaanxi, and Qinghai saw fairly quickly rising growth rates. Of these eight provinces and municipalities, six (except Tianjin and Liaoning) were noted for relatively low per capita GDP. Therefore, the growth rates in 2003–2005 slowed down somewhat in the developed regions and gained momentum in the less developed regions. This resulted directly in smaller regional disparities in the PRC in 2004 and 2005.

Table 2. Regions Posting Greater Growth Rates in 2003-2005 than in 1990s (%)

Year	Zhejiang	Fujian	Hubei	Guangdong	Hainan	Tianjin
1990–2000	14.97	15.30	11.86	14.68	12.52	11.50
2003–2005	13.62	11.73	11.65	14.29	10.40	15.27
Change in growth rate between 2003–2005 and 1990s	-1.33	-3.91	-0.19	-0.34	-2.01	3.74
Year	Shanxi	Liaoning	Heilongjiang	Inner Mongolia	Shaanxi	Qinghai
1990–2000	8.88	9.40	8.21	9.82	9.08	8.16
2003–2005	13.89	12.55	11.64	22.35	12.73	12.23
Change in growth rate between 2003–2005 and 1990s	4.52	3.15	3.23	12.59	3.47	4.08

Source: *Provincial Statistical Yearbook 2006* (31 provinces).

To sum up, the regional growth pattern has changed in recent years; compared with the 1990s, the growth rate in the PRC's developed coastal region has slowed down somewhat. Meanwhile, economic growth rates in low-income regions have increased slightly. As a result, the widening of regional disparities has slowed down.

The factors that led to the changes in the growth pattern and regional disparities included both policies and the macroeconomic environment. Among these the following five factors are assumed to be the more important and effective.

1. The implementation of the Western Area Development Strategy and revitalization of old industrial bases in the northeast has effectively promoted economic growth in these regions and eased widening regional disparities.

The central government decided in 1999 to implement the Western Area Development Strategy. As a result, the state dramatically increased funding for construction in the western region. From 2000 to 2003, the central government spent more than 360 billion yuan in fiscal construction on the development of the western region. In particular, more than 220 billion yuan in long-term government bonds were issued for this purpose. In addition, the financial institutions in the western region increased their loan balance by more than 950 billion yuan. The state launched 50 new key projects in the western region, with a total investment of 730 billion yuan. In 2004, the PRC launched another 10 key projects for the development of the western region, with a total investment of 80 billion yuan. During 2000–2004, the central government allocated a total of about 460 billion yuan in fiscal construction funds for the western region, of which more than one-third was raised through government bonds issued for the western region. The central government also earmarked about 500 billion yuan in

terms of fiscal transfer payments and special subsidies. In October 2003 the central government began to implement policies to revitalize economic and social development in old northeastern industrial bases. Since then the economic growth of three provinces in the northeastern region has accelerated. Table 3 indicates that from 2000 to 2005, the eastern region's share of nationwide investment dropped, and the central and western regions' shares increased.

Table 3. Total Investment in Various Regions in Selected Years (RMB100 m)

Year	Eastern region	Central region	Western region	Northeastern region
1990	2,266.15	790.74	786.49	486
1995	11,503.97	3,120.51	3,046.45	1,703.38
2000	17,484.90	5,597.40	6,110.70	2,703.8
2004	37,262.80	12,523.20	13,748.80	5,582
2005	45,626.30	16,145.55	17,645.04	76,78.82
	Regional Share of Total National Investment (%)			
1990	52.3	18.3	18.2	11.2
1995	59.4	16.1	15.7	8.8
2000	54.8	17.5	19.2	8.5
2004	53.9	18.1	19.9	8.1
2005	52.4	18.5	20.3	8.8

Sources: *China Statistical Yearbook 2006* and *China Fixed Asset Investment Statistical Yearbook 2000*.

Changes in the national distribution of investment in fixed assets led to changes in investment rates in various regions. In the early 1980s, the investment rates were largely identical across the PRC's four regions. In the late 1980s, however, the state introduced an asymmetrical development strategy to allow some regions to get rich first and then let the richer regions help the poorer ones get rich. As a result, the coastal region benefited from system innovation and liberalization. While domestic investment began pouring into the eastern coastal region, foreign investment also became concentrated in this region. Accordingly, the investment rate rose dramatically in the eastern region and remained low in other regions, with the eastern region's investment rate being 7–8 percentage points higher than those of other regions. In the first half of the 1990s, the eastern region's investment rate was about 12 percentage points higher than that of the central region and about 10 percentage points higher than those of the western and northeastern regions. But after 2000, the western region's rate of investment in fixed assets rose visibly and surpassed that of the eastern region. In 2004, the western region's average investment rate was 49.8 percent, which was higher than the eastern region's 42.1 percent, the central region's 39 percent, and the northeastern region's 36.9. Intensive investment spurred rapid economic growth in the western region and a rise in the income level of the local people. Clearly, the implementation of the Western Area Development Strategy has played an important role in narrowing regional disparities.

2. The regions with rich resources have seen their GDP growing faster with economic growth since 2002.

The PRC's economy entered a new round of rapid growth in 2002. Compared with the preceding years, nearly all regions saw their economies grow faster.

In fact, nationwide shortages occurred in the coal, electricity, oil, and transport sectors from 2002 to 2004, with price levels persistently climbing. The price levels of coal and crude oil rose particularly fast. In 2004, the ex-factory price index for the PRC's mining industry was

129.3, far higher than the consumer price index (102.4) and the ex-factory price index for industrial goods (107.1). Steep hikes in energy prices boosted the outputs of various producing regions and directly increased their total output values. They also attracted heavy investment in these sectors, thus pulling up economic growth in the regions where they were located. Table 2 suggests that Tianjin, Shanxi, Jiangxi, Liaoning, Heilongjiang, Inner Mongolia, Shaanxi, Qinghai, and Shandong were the places where growth rates were fairly fast over the two years. Except for Tianjin, all these places have one thing in common: they all enjoy comparative advantage in resource industries (mainly coal, oil, and natural gas). Therefore, we can say that the narrowing of regional disparities in recent years was spurred by the rapid growth of the resource (energy) industries in this new round of economic growth.

3. The pulling effect of foreign direct investment eased somewhat in the eastern coastal region.

Compared with local capital investment, investment from outside a region has a more tangible pulling effect on that region's economic growth because it does not squeeze local consumption. In particular, foreign direct investment not only provides direct funding support, but also brings to the local economy higher levels of technology and management expertise. Therefore, such investment helps increase the competitiveness and growth rate of the regional economy. In the 1990s, foreign direct investment on average accounted for a visibly higher proportion of total investment in the eastern region than in the central and western regions. But after 2000, the ratio of foreign direct investment acquired by the eastern region compared to local GDP declined slightly. The ratio was 8.6 percent in 1995, but dropped to 5.3 percent and 4.4 percent respectively in 2000 and 2004, or 3.3 and 4.2 percentage points lower than in 1995. Compared with 1995, the ratios for the central, western, and northeastern regions went down by 0.15, 1.0, and 0.06 percentage points respectively in 2004. This is an indication that the contribution of foreign direct investment declined somewhat in all regions after 2000. But the fall was more dramatic in the eastern region. Experience tells us that foreign direct investment can better promote the growth of the regional economy than domestic investment does. That is why the decline in foreign direct investment dampened the economic growth advantage of the eastern region over the central and western regions and hence eased the widening gap of regional disparities.

4. Less developed regions saw infrastructure construction advance rapidly.

Infrastructure development is a crucial factor for the speed of development of a regional economy. The development of infrastructure—including transport, communications, water control, and power infrastructure—can raise productivity, reduce costs, and help attract foreign investment and accelerate economic development. A region's geographic location, transport conditions, and telecom facilities strongly indicate disparities in regional economic development, and a policy in favor of balanced infrastructure development can help economic convergence among different regions. In the PRC, the infrastructure in the eastern coastal region has always been better than that in inland regions because of historical, economic, and geographic disparities. Since the beginning of the reform and opening up of the economy, the development of infrastructure in the eastern coastal region has also been faster than in the rest of the country. In recent years, however, its speed of growth in the eastern coastal region has declined somewhat because the infrastructure there is already relatively complete. At the same time, the central and western regions have seen their infrastructure develop faster than the eastern coastal region because of massive infrastructure construction.

Take highways as an example. Table 4 indicates that in the second half of the 1990s, the speed of growth in highways was almost the same in the eastern, central, and western regions. The only exception was the northeastern region. After 2000, however, while

highway development in the eastern region remained fast (6.7 percentage points higher than in 1994–1995), it was faster in the central, western, and northeastern regions. In 2000–2004, the highway development rates for these regions compared with that of the eastern region were 26.4 percentage points, 18.8 percentage points, and 20.9 percentage points higher, respectively. This is an indication that disparities in infrastructure between the different regions in the PRC have begun to narrow. This will have a long-term positive impact on improving the investment conditions and increasing the potential for economic growth in the less developed regions and will inevitably help narrow regional disparities.

Table 4. Regional Highway Mileages & Five-Year Average Growth Rates (%)

Time	East		Central		West		Northeast	
	Mileage	Growth rate	Mileage	Growth rate	Mileage	Growth rate	Mileage	Growth rate
1994	31,253		42,164		35,968		40,233	
1999	38,286	22.5	51,120	21.2	44,388	23.4	43,155	7.3
2004	49,465	29.2	75,454	47.6	63,105	42.2	55,344	28.2

Source: *China Statistical Yearbook 1995, 2000, and 2005.*

5. The central government's attention to and policy measures on agriculture-related issues in recent years also helped ease regional disparities.

In the PRC's less developed regions, a majority of the local population generally lives in rural areas. The 2000 census indicates that rural people accounted for more than 70 percent of the total population in the central and western regions, a figure far higher than that in the eastern region. For this reason, the support for peasants and agriculture was in fact more helpful to the central and western regions and indirectly helped narrow regional disparities. In recent years, the central government has introduced some policy measures to alleviate burdens on peasants. These measures include the experimental reform of rural taxes and fees that began in 2000. Ministry of Finance statistics indicate that the experimental reform covered 620 million rural people or three-fourths of the PRC's total rural population. The lowering of the agricultural tax rate, the reduction of fees required of peasants, reform of the collection and management of educational funds, and issuing of direct farming subsidies to the peasants have gradually alleviated the burdens on the peasants. Agricultural taxes were waived in more provinces and autonomous regions in 2004, and completely abolished throughout the country in 2005. According to a study (Zhu et al., 2003) tracking the experimental reform of rural taxes and fees and the reform of township and village management issued by the Ministry of Agriculture, burdens on peasants were reduced by about 45.8 percent in 2002 in the 20 provinces that carried out the experimental reform of taxes and fees.

D. An empirical analysis of determinants of provincial economic growth

In order to further our understanding of changes in regional disparities, we will conduct a quantitative analysis of determinants of regional economic growth. Using provincial economic growth data, we will investigate the main factors that influence regional economic growth and regional disparities.

The basic estimation method of regional economic growth is regression analysis based on a growth equation derived from the new classical growth model (Barro and Sala-I-Martin, 1995). The basic equation employed here is:

$$(\frac{1}{T})\cdot\ln(\frac{y_{i,t-1+T}}{y_{i,t-1}}) = \alpha - \ln(y_{i,t-1})\cdot[\frac{(1-e^{-\beta_i T})}{T}] + \beta\cdot X + u_i + \varepsilon_{it}, \quad (1)$$

where

T stands for the length of time interval;[6]

$y_{i,t}$ represents provincial per capita GDP in year *t* (calculated in terms of constant prices in 1978);

X stands for factors influencing regional economic growth;

β is coefficient; and

u and ε are residual errors.

Based on results of similar studies, we choose to examine the effects of factors including fixed asset investment rate, average education level, development level of infrastructure, regional marketization degree, urbanization rate, and share of regional government expenditure in GDP on economic growth. The final regression equation is:

$$g_{i,t} = a + \beta_1 \ln(y_{i,t-1}) + \beta_2 Inv_{i,t} + \beta_3 Edu_{i,t} + \beta_4 Inf_{i,t} + \beta_5 Soe_{i,t} + \beta_5 Urb_{i,t} + \beta_6 Gov_{i,t} + u_i + \varepsilon_{it}, \quad (2)$$

where

t (= 1991, 1994, 1997, 2000, and 2003) is the beginning year of each time interval;

$g_{i,t}$ represents average growth rate of per capita GDP of province *i* during the time interval beginning with year *t*;

$Inv_{i,t}$ stands for fixed asset investment rate of province *i* in year *t*;

$Edu_{i,t}$ stands for average education level of province *i* proxied by the share of population with education levels of junior high school or above to population aged six and over, which reflects the impact of human capital level on the economy;

$Inf_{i,t}$ represents development level of infrastructure of province *i* proxied by railway density in year *t*;

$Soe_{i,t}$ is the share of gross industrial output value of state-owned enterprises in total industrial output value of province *i* in year *t*, which represents regional marketization degree,[7]

$Urb_{i,t}$ is the urbanization rate; and

$Gov_{i,t}$ is the share of regional government expenditure in GDP.

[6] We divide the sampling period into several time intervals after accounting for lagged effects of some institutional factors and labor capital on regional economic growth and eliminating effects of business cycle fluctuations. Here T is 3 years.

[7] Since 1999, the gross industrial output value of state-owned and state-controlled enterprises have been included in provincial statistical yearbooks and are both regarded as gross industrial output value of state-owned enterprises, which leads to inconsistency with previous data. Therefore, here we only choose the index of gross industrial output value of state-owned enterprises.

Taking into account the fact that the PRC's economic system has undergone significant changes since its reform and opening up, especially the establishment of a market-oriented economic system after the 1990s, we choose samples between 1991 and 2005, with the time interval of three years, i.e., 1991–1993, 1994–1996, 1997–1999, 2000–2002, and 2003–2005. We choose the explanatory variable's value in the beginning year of the periods rather than average value in three years to overcome the problem of endogeneity. Due to data deficiency of Chongqing, we merge the data of Chongqing and Sichuan and thus get the panel data of 30 provinces.

Now we will conduct the regression analysis. First, we have to perform the Hausman test to choose between a fixed effects model and a random effects model. Also, we have to deal with autocorrelation in residual errors due to the fact that autocorrelation usually exists in time series economic data. Table 5 reports the results assuming autocorrelation and no autocorrelation in residual errors. Based on the model results, we choose a fixed effects model with disturbance term AR(1) (i.e., assume ε_{it} in equation 2 satisfies $\varepsilon_{it} = \rho\varepsilon_{t-1} + v_t$, where $E(v_t) = 0$, $E(v_t^2) = \sigma_v^2$),[8] that is Model I in Table 5.

Table 5. Regression Results of the PRC's Regional Economic Growth (1991–2005)

	Model I	**Model II**
Constant	0.572 (5.66)***	0.351(4.51)***
$\ln(y_0)$	-0.087 (-4.3)***	-0.048 (-3.50)***
Inv	0.072 (2.94)***	0.074 (2.76)***
Edu	0.140 (2.07)**	0.090 (1.27)
Soe	-0.049 (-2.34)**	-0.030 (-1.44)
Train	2.988 (2.87)***	2.985 (2.74)***
Gov	0.117 (1.94)**	0.159 (2.53)**
Urban	0.128 (2.05)**	-0.040 (-0.59)
Samples	120	150
Model	Fixed effects model with AR(1)	Fixed effects model without AR(1)
Hausman value	44.91[$\chi^2(7)$]	80.98 [$\chi^2(7)$]
R-Square	0.376	0.293

Note: T-statistics are included in parentheses; *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Source: *Authors' calculation.*

The results presented in Table 5.5 can shed light on the effects of the above factors on regional economic growth and thus have important policy implications for reducing regional disparities. Based on the regression results, the following key observations should be considered in efforts to form such policies.

1. ***Fixed investment rate is an important factor driving regional economic growth in the PRC***. An increase of one percentage point of fixed investment rate in the beginning year of the time intervals will lead to a rise of 0.072 percentage points in average economic growth rate during the whole time interval. This figure is similar to the estimation of 0.073 percentage points by Cai et al. (2002) but lower than the estimation of 0.2–0.35 percentage points by Demurger (2001). The PRC's relatively high fixed investment rate can exercise an important influence on regional economic growth. The regional fixed investment rate in the PRC is not completely endogenously determined. Local governments can affect the investment decisions of enterprises to some extent and national policies can influence regional distribution of investment (including FDI).

[8] As for testing autocorrelation, Stata software provides two indexes: modified Bhargava et al. D-W and Baltagi-Wu LBI (locally best invariant).

2. ***The improvement of education levels can significantly promote regional economic growth***. According to results shown in Table 5, an increase of one percentage point of the share of people above six years old with education levels of junior secondary school or above in the beginning year of the time interval will raise the regional economic growth rate by 0.14 percentage points in each of the years that followed. In terms of absolute value of the coefficient, the impact of education level on regional economic growth seems to be very large.

3. ***The improvement of marketization degree can significantly boost regional economic growth.*** **We pro**xy regional marketization degree with the share of gross industrial output value of state-owned enterprises in total industrial output value. Generally speaking, the bigger the share of state-owned enterprises of one region, the higher local government interference with the economy and the lower regional marketization degree. Therefore, the coefficient of marketization degree should be negative. According to our regression results, the coefficient of *Soe* is statistically significant and negative, indicating that for those regions with big shares of state-owned enterprises in the beginning year, their economic growth rate will be slower in the years that followed. That is, high regional marketization degree can promote economic growth, which is consistent with results of Cheng and Yi (2000) and Lin and Liu. (2003).

4. ***There is a significantly positive correlation between the development level of infrastructure and regional economic growth***. We use the index of railway density to measure the development level of infrastructure and find that the coefficient is positive, which is consistent with results of Demurger (2001). The impact of infrastructure level on regional economic growth is relatively large. In Shanxi province, for example, an increase of 0.0046 km per km^2 of railway density from 1990 to 2002 is accompanied by a rise of 1.38 percentage points of regional economic growth rate.

5. ***The share of regional government expenditure in GDP (which reflects government interference with the economy) has a positive impact on regional economic growth***. An increase of one percentage point in the share of regional government expenditure in GDP can increase the regional economic growth rate by about 0.12 percentage points.

6. ***Urbanization level exerts a significantly positive impact on regional economic growth***. An increase of one percentage point in the urbanization rate in the beginning year can step up the regional economic growth rate by about 0.13 percentage points in the years that followed. Other previous studies such as Lu and Chen (2004) also showcase similar results.

7. ***Significant conditional convergence existed among regions in the PRC in the period 1991–2005***. That is, after controlling other factors, the economic growth rate of more developed regions was slower, which is confirmed by the negative coefficient of $\ln(y_0)$. The evidence of previous similar studies seems to be mixed. Some studies (Cai et al., 2002; Lin et al., 2003) show that there exists conditional convergence among regions in the PRC while others (Wang, 2004) find that such convergence does not exist.

INCOME DISPARITIES WITHIN PROVINCES AND THEIR CHANGES

Due to the large land and population size in the provinces, natural endowments, economic and social conditions, and the culture of various regions within a province also differ greatly. The income disparity within provinces could be a serious problem. In this section we use the data of prefectures and counties to analyze the income disparity within provinces.

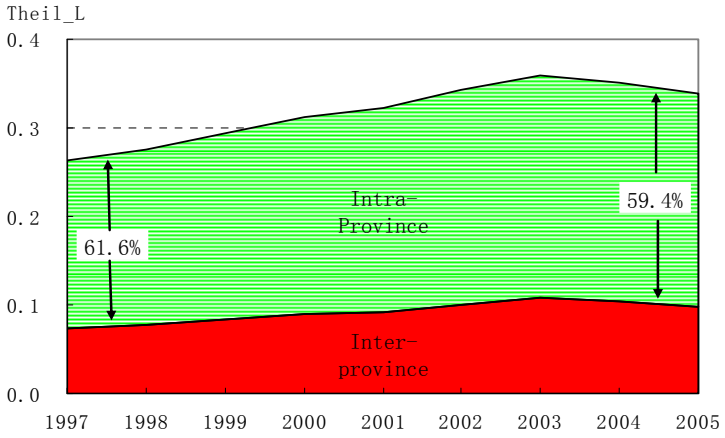
E. Degree of Income Disparities within Provinces

In order to analyze income disparities within provinces, we examine indicators of per capita GDP at the prefecture level. Based on the PRC's administration framework, a province is generally composed of around 12 regional districts. The data listed in Table 6 represent the ratio of maximum to minimum per capita GDP at the prefecture level within each province during the period 1997–2005.

The ratio of maximum to minimum per capita GDP at prefecture level demonstrates obvious gaps within each province. In 2005, the ratios ranged from 2.6 to 10.4, and the average was 5.6. Gansu province had the biggest gap. In 2005, per capita GDP of Jinchang prefecture was 24,950 yuan, while that of Dingxi prefecture was 2,394 yuan (the lowest in the PRC), the former being 10.4 times the latter. In Guangdong province, per capita GDP of Shenzhen prefecture was 60,801 yuan, which is 8.1 times of that of Heyuan prefecture.

Figure 18 illustrates the results of decomposition of income disparity among 28 provinces (excluding Beijing, Tianjin, and Shanghai) with that within the provinces. In terms of the spatial decomposition of the Theil index of regional disparity, the level of disparity within the provinces is even higher than the level of disparity among the provinces. As Figure 18 shows, compared with the consideration given only to inter-province disparity, inter-prefecture disparity increased significantly. In 2005 for example, the value of the Theil index among the provinces is 0.098, but when the disparity between prefectures within provinces is taken into consideration, the overall value of the Theil index increased to 0.241. The latter value is 2.5 times the former. Looking at the share of disparity within and among the provinces in overall disparity, the share of disparity within the provinces is higher than the share among the provinces. From 1997 to 2005, disparity within the provinces had a share around 57.2% to 61.6% of the total value of disparity. It has surpassed the disparity among the provinces. The decomposition of the Theil index shows that intra-province disparities are even more significant than inter-province disparities.

Figure 18. Decomposition of Theil Indexes of Per Capita GDP at Prefecture Level



Source: *Provincial Statistical Yearbooks from 1998 to 2006* (31 provinces).

Generally speaking, intra-province disparities are larger than inter-province gaps in many places, which can be reflected from the ratio of maximum to minimum per capita GDP (MMR) within and across provinces. Table 6 shows that in 2005, 20 provinces among the 28 had MMRs larger than the national inter-province MMR (that is, 5.5).

Table 6. Max to Min Ratio of Per Capita GDP among Prefectures within Provinces

	No. of prefectures	1997	1998	1999	2000	2001	2002	2003	2004	2005	2005-1997
Hebei	11	2.5	2.5	2.7	2.8	2.8	2.8	2.8	2.7	2.8	+
Shanxi	11	3.8	4.1	4.7	4.5	4.7	4.4	4.2	4.4	4.7	+
Inner Mongolia	12	3.9	3.9	3.6	3.4	3.6	3.6	4.0	3.9	5.3	+
Jilin	9	2.6	3.0	2.9	3.4	3.4	3.1	3.0	3.1	2.7	+
Heilongjiang	13	1.8	1.8	2.0	2.3	2.5	2.5	2.7	2.7	3.0	+
Jiangsu	13	7.4	7.2	7.2	6.9	7.1	7.5	8.8	9.0	9.3	+
Anhui	17	3.3	3.8	3.8	4.6	5.1	5.4	6.0	7.0	8.0	+
Jiangxi	11	3.5	3.6	3.6	3.5	3.6	3.6	3.6	3.6	3.7	+
Shandong	17	7.9	8.6	9.0	9.2	9.6	9.8	10.1	9.8	9.2	+
Henan	17	3.4	3.4	3.3	3.5	3.9	3.7	4.5	4.3	4.6	+
Hubei	13	4.7	4.9	5.1	5.1	5.4	5.7	5.8	5.8	5.8	+
Hunan	14	3.8	4.1	4.2	4.4	4.5	4.8	4.4	4.5	4.8	+
Chongqing	19	4.0	5.3	5.3	5.2	5.2	5.1	3.9	3.9	4.6	+
Sichuan	21	4.8	4.8	5.3	5.3	5.9	6.0	5.9	4.5	5.2	+
Guizhou	9	4.4	4.5	4.5	4.6	5.0	5.1	4.9	4.9	4.7	+
Gansu	14	7.8	8.3	7.0	7.5	7.4	7.3	7.7	8.7	10.4	+
Qinghai	8	6.5	7.1	5.5	5.6	5.8	5.7	5.8	5.7	6.9	+
Xinjiang	14	8.9	8.7	9.1	9.3	8.9	9.0	9.4	9.3	10.1	+
Zhejiang	11	3.7	3.9	4.0	4.1	3.9	3.8	3.7	3.7	3.7	0
Guangdong	21	12.3	12.9	13.1	13.8	13.7	13.1	14.6	13.9	8.1[a]	-
Liaoning	14	6.9	7.1	8.1	10.0	8.8	8.2	8.2	7.7	6.1	-
Fujian	9	5.4	5.8	5.8	5.7	5.7	6.3	3.9	3.9	4.0	-
Guangxi	14	3.9	4.0	4.2	4.4	4.3	4.4	3.3	3.3	3.0	-
Hainan	2	3.6	3.6	3.5	4.4	4.2	4.1	2.4	2.4	2.6	-
Yunnan	16	10.4	9.5	7.6	6.8	6.4	6.7	6.9	6.7	5.3	-
Tibet	7	3.7	3.8	3.4	3.8	3.7	3.8	3.0	3.6	3.5	-
Shaanxi	10	4.7	4.5	4.7	4.2	4.1	4.0	4.1	4.2	4.2	-
Ningxia	5	9.4	7.7	7.6	8.3	7.4	6.0	5.9	5.9	7.0	-
Average	12.6	5.3	5.5	5.4	5.6	5.6	5.6	5.6	5.6	5.6	
National[b]		4.8	4.9	4.9	4.9	4.9	5.2	5.5	5.6	5.5	

Notes: Data do not include three municipalities (Beijing, Shanghai, and Tianjin), and some oil-based cities such as Daqing ib Heilongjiang, Dongying in Shandong, Kelamayi in Xinjiang, and Jiayuguan in Gansu.

a/ The sudden drop in MMR of Guangdong in 2005 was due to the change of coverage of urban population. Before 2004, the figure for the urban population was based on registration system. Since 2004, inhabitant population has been used. For example, in Dongguang City, Guangdong in 2004 the figure for the urban population based on the registration system was 1.62 million, while based on the inhabitant population it was 6.56 million.

b/ That is, inter-provincial MMR exclusive of Beijing, Tianjin, and Shanghai.

Sources: Provincial Statistical Yearbooks from 1998 to 2006 (31 provinces).

Considering the changes of disparity within provinces over time, from 1997 to 2005, the regional disparities within most of the provinces widened. The MMR of 18 provinces (see last column of Table 6) increased during that period; it remained stable in one province, and declined in 9 provinces. Appendix C provides Theil indexes based on prefecture-level data in

each province. Similarly to the MMR, the Theil indexes of 19 provinces increased in 2005 compared with 1997, and decreased in 9 provinces. These facts demonstrate that intra-province disparity in income of most provinces has widened in recent years. Compared with the inter-province Theil indexes, we could conclude that in most of the provinces, internal disparities in income among prefectures within provinces are more significant than inter-province income disparities.

If we consider the indexes at the county level, intra-province disparities should become more obvious. Table 7 gives the ratio of maximum to minimum per capita GDP at the county level cross all the provinces (excluding Beijing, Tianjin, and Shanghai). The ratio in Hainan province was the lowest (2.2), and the ratio in Jiangsu province was the highest (25.8). In 2005, per capita GDP in Kunshan county, Jiangsu province was 113,025 yuan, which is 25.8 times that in Guanyun county (4,379 yuan) in the same province. Further, if we consider the data of urban areas in big cities, intra-province disparity could be larger. For example, the MMR of Guangdong province is 9.5, which will increase to 16.4 if we include the data of Shenzhen.

Table 7. Regional Disparities at the County Level by Ratio Maximum to Minimum Per Capita GDP (2005)

Eastern	MMR	Central	MMR	Northeastern	MMR	Western	MMR
Hebei	10.3	Shanxi	22.3	Liaoning	7.7	Inner Mongolia	14.1
Jiangsu	25.8	Anhui	5.9	Jilin	3.9	Guangxi	5.5
Zhejiang	10.1	Jiangxi	5.4	Heilongjiang	18.1	Chongqing	3.9
Fujian	6.0	Henan	7.5			Sichuan	7.9
Shandong	13.5	Hubei	5.0			Guizhou	5.4
Guangdong	9.5	Hunan	7.4			Yunnan	13.9
Hainan	2.2					Shaanxi	25.4
						Gansu	22.7
						Qinghai	10.0
						Ningxia	8.2
						Xinjiang	25.3

Note: not including data of urban areas monitored by big cities.

Source: *China Statistical Yearbook for Regional Economy 2006*

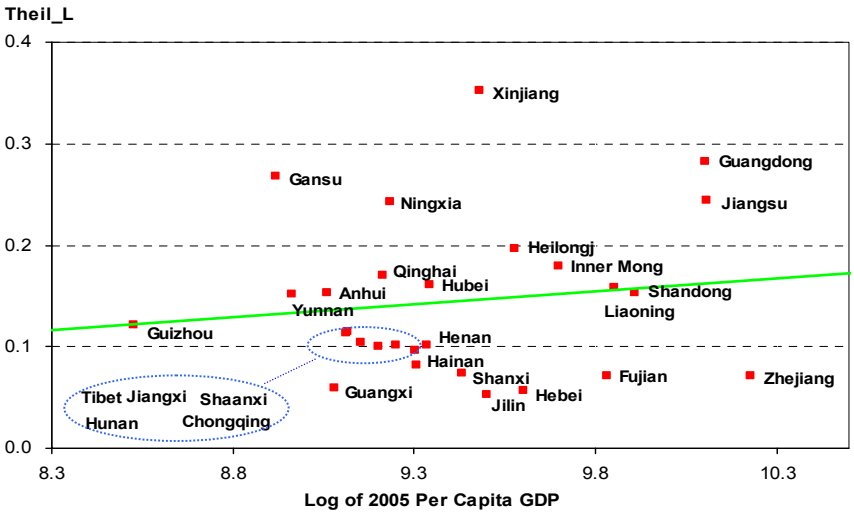
F. Relationship between Intra-province Disparities in Income and Economic Development Level

The relationship between intra-province gaps and economic development is an interesting and important issue. According to the inverted U-shaped hypothesis (Williamson, 1965), residents of developed areas pay more attention to regional gaps than do residents of less developed areas because the local governments in developed areas have more financing power to balance the development across areas. Therefore, developed areas are less likely to suffer from large regional disparities.

Figure 19 illustrates the relationship between economic development level (value of per capita GDP) and intra-province disparities in 2005 (by Theil indexes at the prefecture level within provinces, excluding Beijing, Tianjin, and Shanghai). Overall, there is no significant relationship between these two. In some less developed provinces, intra-province disparities are insignificant, like in Guangxi and Guizhou. In other less developed provinces, these disparities are salient, like in Gansu. Similarly, some of the developed provinces, like

Zhejiang, have smaller intra-province gaps, whereas in Guangdong and Jiangsu, these disparities are much larger.

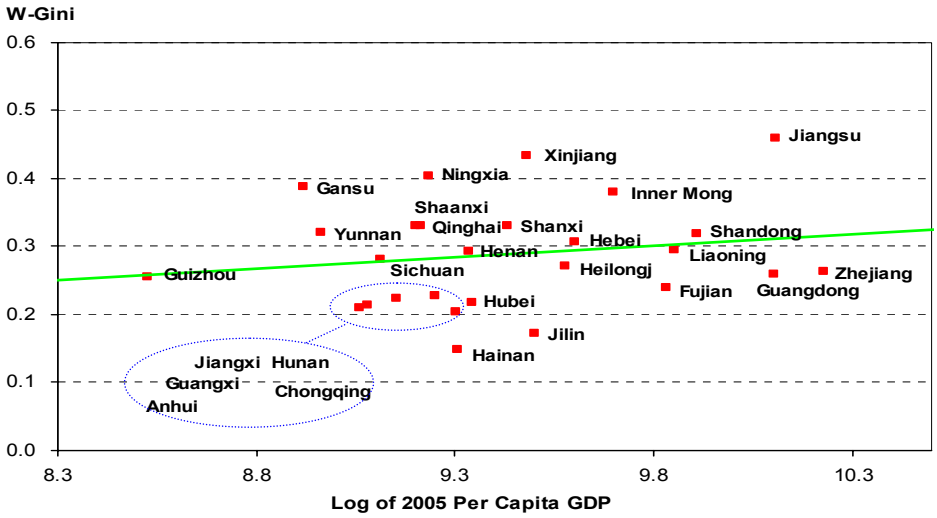
Figure 19. Relationship between Economic Development Level and Provincial Theil Indexes at Prefecture Level



Source: Authors' calculation.

Figure 20 demonstrates the relationship between provincial economic development level and intra-provincial disparities at the county level. Because counties are at a lower administrative level than prefectures, differentiating the data of the counties from one another could indicate intra-province disparity more accurately. Similarly to the results of the prefecture level data, we found no significant relationship between regional disparities and economic development level.

Figure 20. Relationship between Economic Development Level and Provincial Gini Coefficient of Per Capita GDP at County Level



Source: Authors' calculation.

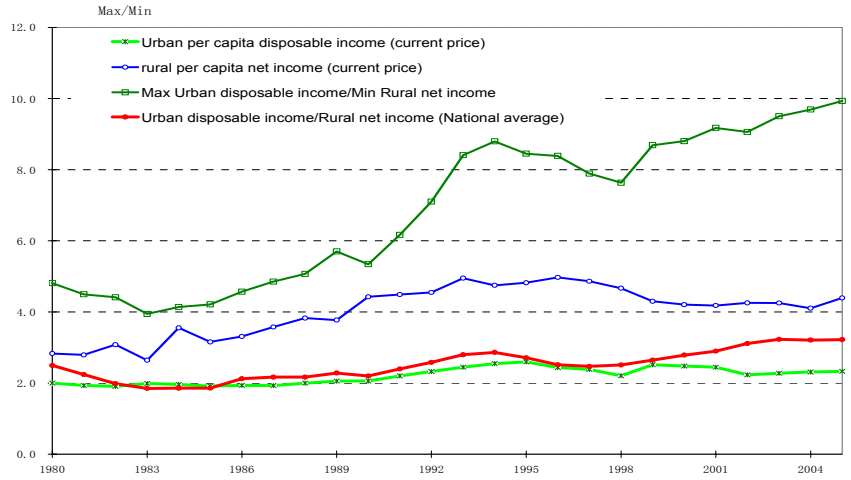
REGIONAL INCOME DISPARITY AND RURAL-URBAN INCOME GAP

The income gap between rural and urban areas is the main component of Chinese income inequity. This rural-urban gap has widened since 1994, and has exerted a significant influence on national income inequity. Using a data set that includes data of household consumption in 28 provinces of the PRC from 1983 to 1995. Kanbur and Zhang (1999) find that rural-urban disparities account for 70 percent of total regional gaps. Further, since the late 1990s, the PRC's urbanization rate has accelerated. From 1978 to 1995, the urbanization rate improved 0.65 percentage point annually on average; while during 1996 to 2005, urbanization rate grew at 1.4 percentage points annually. Additionally, the PRC's regulations on population migration from rural to urban areas have significantly relaxed recently, and this has resulted in a huge amount of rural labor moving to urban areas. All of these trends influence rural-urban gaps significantly.

G. Inter-provincial Rural-urban Income Disparity based on MMR

Figure 21 describes inter-provincial disparities in terms of MMR of urban and rural household income. The MMR of inter-provincial urban household disposable income has been very stable, and has stayed around 2.2. The MMR of inter-provincial rural household net income has not changed much, but its ratios were higher than urban ones.

Figure 21. Inter-provincial disparities of rural and urban measured by MMR of household income (at current prices)



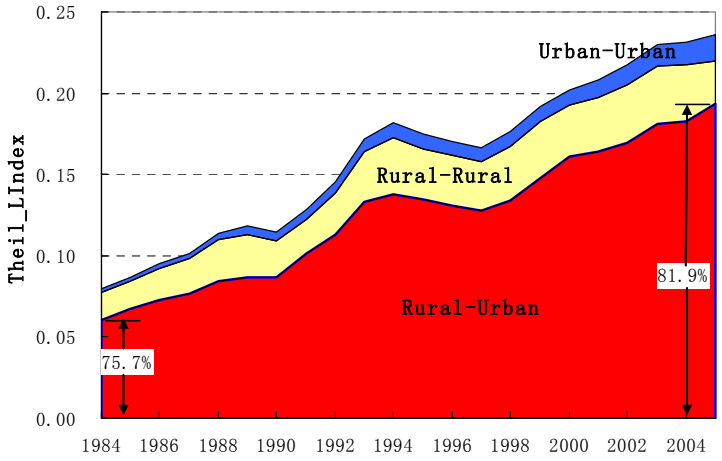
Source: *Provincial Statistical Yearbooks 2006* (31 provinces).

The ratio of the highest urban disposable income to the lowest rural net income among the provinces was 4.5 in 1980 and reached 8.8 in 1994. Since then, the expansive trend of urban-rural income disparities has slowed somewhat, with the ratio of 9.9 in 2005. This high ratio shows that the income gap between rural and urban areas is significant.

H. Decomposition of inter-provincial disparity into rural-urban income gap

Figures 22 and 23 illustrate how the Theil indexes of inter-provincial income disparities decomposed into gaps between rural and urban areas, between urban areas, and between rural areas. We divide each province into urban and rural areas and get 62 regions within the nation, with half of the areas rural and the other half urban. The Theil indexes are decomposed based on this classification. Figures 22 and 23 demonstrate the results based on per capita household consumption and household income, respectively. Both sets of results indicate the following characteristics of rural-urban disparity:

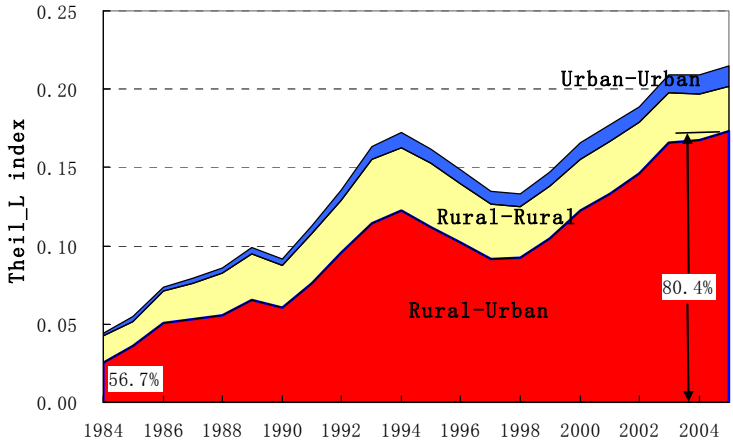
Figure 22. Decomposition of Inter-provincial Income Disparity into Urban and Rural Areas based on Per Capita Household Consumption



Source: *Provincial Statistical Yearbooks 2006* (31 provinces).

The results of the decomposition indicate that the inter-urban areas income disparity based on the level of household consumption increased relatively faster, but its share in total disparity is still very small. In 1984, the Theil index of the level of household consumption among urban areas is only 0.002. This reflects that the disparity of consumption among urban was small by that time. This index grew to 0.017 in 2005, which is 7 times the value in 1984, but the disparity of consumption level of urban areas accounts for only 7% of the total value of disparity. Similarly, the Theil index of household income among urban areas grew from 0.002 in 1984 to 0.014 in 2005; its share of total disparity increased from 4.5% to 6.3% (Figure 22).

Figure 23 Decomposition of Inter-provincial Disparity into Urban and Rural Areas based on Household Income



Source: *Provincial Statistical Yearbooks 2006* (31 provinces).

There was also an increase in regional disparity to some extent among the rural areas. Like the disparity among urban areas, this inter-rural disparity also has a relatively small share of total disparity. The Theil index of the level of consumption among rural areas increased from 0.017 in 1984 to 0.026 in 2005, but its share in total disparity decreased from 21.4% to 11.1% in the same period. The Theil index of household income disparity among rural areas increased from 0.017 to 0.029 in the same period, and its share of total disparity decreased greatly from 38.8% to 13.3%.

Both the absolute values and the share to total disparity indicate that the increase of disparity between the urban and rural areas is very significant. The increase of total disparity is mainly due to the increase of disparity between the urban and rural areas. The disparity of the level of consumption between the urban and rural areas has a share of total disparity around 75.6% to 81.9% from 1984 to 2005. The Theil index of household income disparity between the urban and rural areas increased from 0.025 to 0.173 in the same period, which accounts for 86.6% of the net amount of increase of total income disparity; the share in total disparity also increased from 56.7% to 80.4%.

CONCLUSIONS AND POLICY IMPLICATIONS

Regional income disparities in the People's Republic of China (PRC) have caught widespread attention recently. Many studies have examined different aspects of these disparities. Using regional data after adjustment based on the PRC's first economic census (conducted in 2004), we have attempted to conduct a comprehensive analysis of regional disparities in the PRC using various measurement indexes. Unlike many existing studies, our study includes in-depth research on regional disparities within provinces in addition to disparities among them. The findings show that regional disparities in the PRC have the following main features:

1. ***Disparities among the PRC's four regions, especially between the eastern region and the other regions, are mainly to blame for inter-provincial disparities***.

Since the PRC began its reform and opening up of the economy, inter-provincial disparities have experienced a process of first narrowing and then expanding. In the early period of the reform, there were large internal disparities within the eastern region. But after the PRC first carried out the policy of opening up in the eastern region and attracted a great deal of foreign investment, the development of some less developed eastern provinces was greatly promoted. Thus, internal disparities within the eastern regions declined, which contributed much to the decline of overall regional disparities in the PRC. After the 1990s, the growth rate in the more developed eastern region was still faster than that of the national average level, resulting in further expansion of disparities between the eastern region and the other regions and aggravating the regional inequality of the whole country. In 2005, disparities among the four regions accounted for more than 70% of total disparity, dominating the trend of regional disparities.

2. ***Regional disparities exist both among provinces and within provinces***.

In addition to the great differences among provinces in terms of area, population, and economic development level, disparities within provinces are also very common in the PRC. Whether judged by absolute level or indirect measurement indexes, internal disparities within many provinces have even exceeded inter-provincial disparities. Based on the analysis of county- and prefecture-level data, we discovered that internal disparities within provinces have shown no significant correlation with the economic development level of provinces. Large internal disparities exist not only within the low-income provinces but also within the eastern coastal high-income provinces. Compared with the levels in 1997, internal disparities in many provinces had expanded somewhat by 2005.

3. ***Urban-rural disparities are the main source of regional disparities***.

Urban-rural disparities have contributed over 70% of regional disparities since the mid-1980s. The increase in regional disparities has been due mainly to the rapid expansion of urban-rural disparities. Urban-urban and rural-rural disparities have also expanded somewhat, but they only account for a small share of regional disparities. Since 2000, the urbanization process in the PRC has been accelerated and the scale of urban-rural labor

migration is also very huge, but urban-rural disparities continue expanding due to the fact that the economic growth rate in urban areas is much higher than in rural areas.

4. *The expansive trend of inter-provincial disparities has slowed down and started to decrease somewhat since 2000*.

By analyzing the data after adjustment based on the PRC's first economic census, we found that compared with the 1990s, the widening of regional disparities in the PRC has gradually slowed down since 2000. In 2004 and 2005, some statistical indicators, such as per capita GDP and household consumption level at current prices, show that regional disparities have declined to a certain extent.

The analysis indicates that compared with the 1990s, the growth rate in the PRC's coastal developed region has slowed down somewhat in recent years. Meanwhile, economic growth rates in low-income regions have become slightly higher. As a result, the widening of regional disparities has slowed down. The factors that led to the changes in regional disparities included both policies and the macroeconomic environment. As far as policies were concerned, the implementation of the Western Area Development Strategy, the attention to agriculture-related problems, and a host of other policy measures helped stimulate fast growth and increase personal income in the less developed regions. With regard to the macroeconomic environment, most of the provinces that have posted faster economic growth in recent years were those enjoying a comparative advantage in resource industries. This is because the new round of economic growth has produced a strong demand for energy and resources and stimulated a rapid development of the energy and resource industries. In addition, the fact that infrastructure construction has accelerated in the central and western regions and narrowed their disparities with the eastern region, as well as the fact that some industries have begun to move from the eastern to the central and western regions, has also helped promote coordinated development between various regions.

5. *Changes in regional disparities are caused by many factors*.

Changes in regional disparities in recent years can also be attributed to some cyclical factors, such as the fast development of resource industries. For this reason, we still cannot claim that the PRC's regional disparities have started a decline that will continue. But experience in the past few years indicates that if the government adopts appropriate policy measures, including improvement of the investment climate, investment in human capital, improvement of infrastructure in the less developed regions, reducing farmers' burdens and increasing their incomes, and strengthening of the transfer payment system, it can alleviate the widening of regional disparities and help achieve coordinated development between the regions.

APPENDIX A: PRC'S ADMINISTRATIVE DIVISION SYSTEM AND REGIONAL DIVISION

A. Administrative Division into Districts

Over time, the PRC has developed an administrative system that recognizes four levels of districts: the province level (including provinces, autonomous regions, and municipalities), the prefecture level (including cities at prefecture level), the county level (including counties, autonomous counties, and cities at the county level, as well as districts under the jurisdiction of cities), and the township level.

Province-level districts are commonly used as geographical units in regional disparity analysis. Researchers often choose this level for their analysis because the geographical coverage and population distribution in the provinces are relatively stable and, more importantly, because each province has a Bureau of Statistics and datasets. After the foundation of the PRC, 29 provincial districts were established by the end of 1957, including the three municipalities of Beijing, Tianjin, and Shanghai. In 1988, Hainan district, which had belonged to Guangdong province, was upgraded to be Hainan province. Chongqing, which had belonged to Sichuan province, became a fourth municipality in 1997. At the end of 2005, there were 31 provinces in the PRC. These provinces had an average population of 41.0 million and an average GDP of 590 billion yuan (about 72 billion dollars calculated by that year's exchange rate).

Each province-level district is composed of about 12 prefecture-level districts (in 2005, besides municipalities, there were 333 prefecture-level districts in the country). The average population of each prefecture was about 3.2 million in 2005, and the average GDP was 46 billion yuan, which equals 5.6 billion dollars calculated by that year's exchange rate.

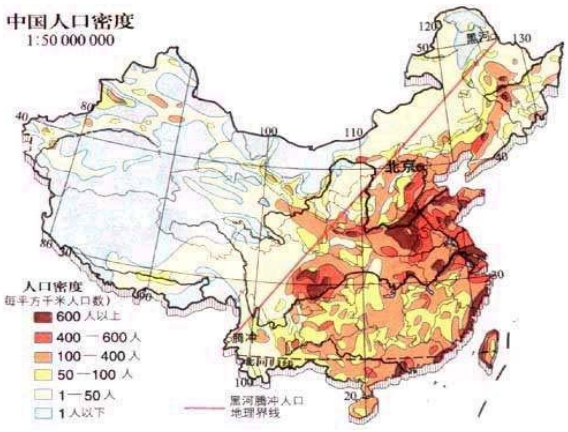
Prefecture-level districts include a number of county-level districts. There are 2,862 county-level districts, about 7 in each prefecture. In 2005, each county had about 450 thousand people and a GDP of 6.4 billion yuan, which is equal to 0.78 billion dollars.

B. Regional Division

Among the PRC's 31 provinces, there are significant differences in natural environment, population, social structure, science and technology, and economic development. We usually assign the 31 provinces into several regions as the basic outline of policymaking and related analysis.

Hu Hanyong Line. In 1935, a Chinese geographer, Hu Huanyong (1935), identified a borderline to differentiate population density. This was illustrated in his book, *Population Distribution in China*. The line started from Heihe, Heilongjiang Province, extended to the southwest, and ended in Tengchong, Yunnan Province (Figure A-1). He stated that on the land southeast of this line, which accounted for a mere 36% of the total national land area, 96% of the national population was living. Meanwhile, northwest of the line, the other 64% of the total land was occupied by only 4% of the national population. This borderline is referred to as the "Hu Hanyong Line;" it has been applied broadly as a regional division method in the analysis of population, geography, and ecology.

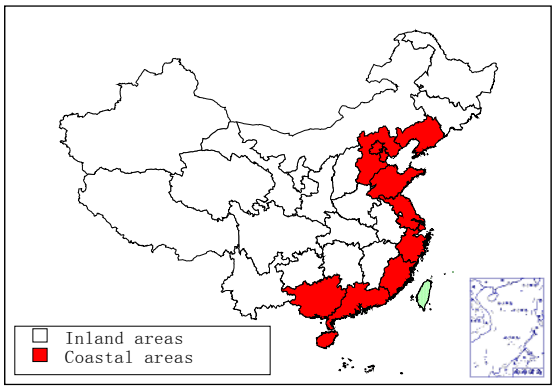
Figure A-1. The Hu Huanyong Line to Divide Chinese Regions



Source: *Population Distribution in China* (1935).

Coastal vs. Inland Regions. From 1949 to 1986, coastal and inland regions were commonly differentiated in economy planning and statistical analysis (Figure A-2). This division is similar to the Hu Huanyong Line. It divides the PRC's 31 provinces into two regions: coastal and inland. The coastal region includes 11 provinces: Beijing, Tianjin, Shanghai, Hebei, Liaoning, Shandong, Jiangsu, Zhejiang, Fujian, Guangdong (including Hainan), Guangxi.

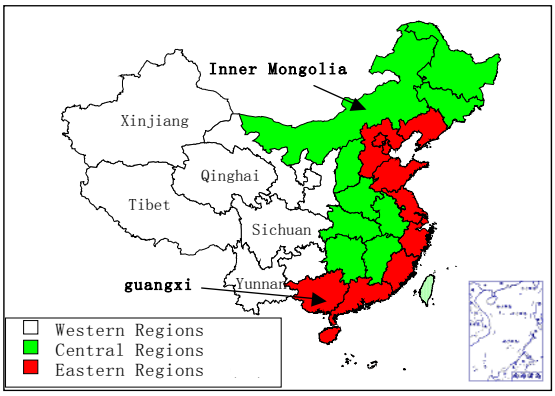
Figure A-2. Coastal vs. Inland Division before 1986



Source: *Notice of How to Define the Coastal and Inland Regions*, the State Planning Commission and National Bureau of Statistics of China, 26 May 1982.

Eastern, Central, and Western Areas. From 1986 to 2005, the division of eastern, central, and western areas was dominant in research on regional disparities in the PRC. In the "Seventh-Five Year Plan," the State Planning Committee divided as the PRC into three regions: eastern, central, and western (Figure A-3). The eastern area included 12 coastal provinces (Beijing, Tianjin, Shanghai, Liaoning, Hebei, Shandong, Jiangsu, Zhejiang, Guangdong, Fujian, Guangxi, and Hainan); the central area was composed of 9 provinces (Heilongjiang, Jilin, Neimenggu, Shanxi, Henan, Hubei, Hunan, Anhui, and Jiangxi); the western area also comprised 9 provinces (Shanxi, Gansu, Ningxia, Qinghai, Xinjiang, Sichuan, Yunnan, Guizhou, and Tibet). After the launch of the Development of the Western Region strategy in 1999, Guangxi and Nemenggu, which originally belonged to the eastern and central areas, respectively, were assigned to the western area.

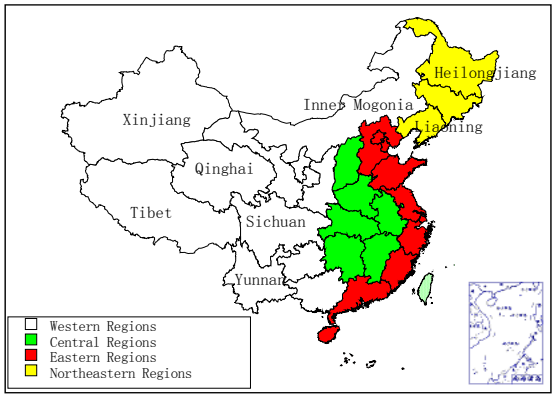
Figure A-3. Eastern, Central, and Western Division from 1986 to 2005



Source: *Seventh Five-Year Plan for for National Economic and Social Development of the PRC*.

Four-Region Division. After 2005, the PRC's central government has divided the nation into four regions in the Eleventh Five-Year Plan. The current regions are eastern, central, western, and northeastern areas (Figure A-4).

Figure A-4. Four-Region Division after 2006



Source: *Outline of the Eleventh Five-Year Plan for National Economic and Social Development of the PRC*.

The four-region division is updated to differentiate the 31 provinces in the PRC. More importantly, it helps the government to develop corresponding macroeconomic policies. For example, the Development of the Western Region strategy focuses on the western regions, while the strategy to revitalize the northeastern region and other old industrial bases aims to promote the development of the northeastern region. The four-region division is reasonable given the current environment, and the intra-regional disparities are much smaller than the inter-regional disparity (see Figure 11). Therefore, we have analyzed regional disparities based on this four-region system.

APPENDIX B: MEASURES OF REGIONAL INEQUALITY

The measurement of regional disparities is an arduous task; no single statistical measure is able to capture its myriad dimensions. This paper has applied some widely used measures to highlight various dimensions of regional income inequality. The selected measures are briefly described in the following paragraphs.

1) Maximum to minimum ratio (MMR)

A comparison of the per capita GRDP (gross regional domestic product, or other index such as per capita consumption or per capita income) of the region with the highest income to that of the region with the lowest income (minimum per capita GRDP) provides a measure of the range of the disparity between them. Maximum to minimum ratio (MMR) provides a quick, easy to comprehend, and politically powerful measure of regional income inequality.

2) The Gini index is widely used in the inequality literature. Following Shankar and Shah (2003), we compute the unweighted Gini index as follows:

$$G_u = \left(\frac{1}{2\bar{y}_u}\right) \cdot \frac{1}{n(n-1)} \sum_i^n \sum_j^n \left| y_i - y_j \right|,$$

where y_i and y_j are the GRDPs per capita of regions *i* and *j*, respectively. *n* is the number of regions, and $\bar{y}_u$ is the unweighted mean of the per capita GRDPs. G_u varies from 0 for perfect equality to 1 for perfect inequality.

The unweighted Gini index takes every region in the same magnitude, i.e., every region was taken as one equal unit regardless of its population size. The weighted Gini index, which weights the regions' per capita GRDPs based on their respective population proportions, is calculated as shown below:

$$G_u = \left(\frac{1}{2\bar{y}}\right) \cdot \sum_i^n \sum_j^n \left| y_i - y_j \right| \frac{P_i P_j}{P^2},$$

where $\bar{y} = GDP/P$ is the national mean per capita GDP. P_i and P_j are the populations of regions *i* and *j*, respectively. *P* is the national population, and *n* the number of regions. G_u varies from 0 for perfect equality to 1 - (P_*/P) for perfect inequality, where P_* represents the population of the region which produced the total GDP. If P_* is small compared to *P*, i.e., if the region with a small proportion of the population produced all the GDP, then the value for perfect inequality would approach 1.

3) Another commonly used measure of inequality is the Theil index. Following Theil (1967), it is computed as follows:

$$Theil\_T = \sum_i \gamma_i \log \frac{\gamma_i}{p_i},$$

where γ_i is the GDP share of region *i* and p_i is the population share of region *i*. For equal per capita GRDPs, i.e., with GRDPs proportional to regional populations, this index takes a value of 0. For a case where region *i* produces the entire GDP, *Theil* becomes $\log\left(P/P_i\right)$,

where P is the total population of the country, and P_i is the population of region *i*. Note here that as the population share of region *i* decreases, *Theil* increases if region *i* produces the entire GDP.

Similar to the $Theil\_T$ index, we can compute the $Theil\_L$ index, which uses the population share as a weight, i.e., $Theil\_L = \sum_i p_i \log \frac{p_i}{\gamma_i}$.

Compared to other measures of inequality such as Gini, CV (coefficient of variation), and Rw (relative mean deviation), Theil indexes satisfy several desirable properties, i.e., they are additively decomposable, and satisfy mean independence (or income-zero-homogeneity), the principle of population replication (or population-size independence), and the Pigou-Dalton principle of transfers (Bourguignon, 1979; Shorrocks, 1980, Akita et al., 1999). An inequality index is said to be additively decomposable if total inequality can be written as the sum of between-group and within-group inequality. Mean independence implies that the index remains unchanged if everyone's expenditure is changed by the same proportion, while population-size independence means that the index remains unchanged if the number of households at each expenditure level is changed by the same proportion, i.e., the index depends only on the relative population frequencies at each expenditure level, not the absolute population frequencies. Finally, the Pigou-Dalton principle of transfers implies that any expenditure transfer from a richer to a poorer household that does not reverse their relative ranks in expenditures reduces the value of the index.

Suppose that the regions are grouped into mutually exclusive and collectively exhaustive groups and each group can be divided into several small sub-regions. The Theil index can be decomposed into within-group and between-group components as follows:

$$Theil\_L = \sum_{i=1}^{I} p_i \log \frac{p_i}{\gamma_i} + \sum_{i=1}^{I} p_i \sum_{j=1}^{n_i} p_{ij} \log \frac{p_{ij}}{\gamma_{ij}} = L_B + L_W ,$$

where the meanings of p_i and γ_i are the same as above, I is the number of groups, p_{ij} is population share of sub-region j in group i, γ_i is the GDP share of sub-region j in group i, L_B is the between-group component of the Theil index L and measures the extent of inequality due solely to differences in the group mean per capita GDP. L_w is the within-group component of the Theil index L and is defined by a weighted average of within-group Theil indexes $\mathrm{L_i} = \sum_{j=1}^{n_i} p_{ij} \log p_{ij} / \gamma_{ij}$ with the weights being the population shares of the groups P_{ij}.

APPENDIX C: INTRA-PROVINCE DISPARITIES AT PREFECTURE LEVEL SHOWN WITH THEIL INDEXES

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2005-1997
Jilin	0.040	0.049	0.054	0.078	0.084	0.085	0.088	0.084	0.052	+
Hebei	0.043	0.044	0.047	0.050	0.051	0.052	0.053	0.051	0.057	+
Guangxi	0.073	0.084	0.090	0.096	0.097	0.091	0.067	0.063	0.059	-
Fujian	0.090	0.097	0.102	0.106	0.104	0.111	0.074	0.073	0.071	-
Zhejiang	0.063	0.065	0.066	0.069	0.068	0.067	0.068	0.070	0.072	+
Shanxi	0.089	0.089	0.098	0.097	0.099	0.090	0.077	0.077	0.073	-
Hainan	0.077	0.077	0.076	0.116	0.110	0.107	0.063	0.062	0.082	+
Chongqing	0.105	0.146	0.141	0.145	0.149	0.139	0.081	0.075	0.097	-
Shaanxi	0.112	0.110	0.128	0.122	0.119	0.116	0.120	0.117	0.100	-
Henan	0.068	0.068	0.062	0.066	0.072	0.072	0.095	0.093	0.102	+
Hunan	0.054	0.058	0.061	0.073	0.080	0.085	0.076	0.079	0.102	+
Jiangxi	0.080	0.079	0.080	0.080	0.085	0.090	0.096	0.101	0.105	+
Sichuan	0.128	0.131	0.151	0.155	0.163	0.166	0.162	0.117	0.114	-
Tibet	0.116	0.117	0.113	0.132	0.127	0.137	0.101	0.116	0.115	-
Guizhou	0.106	0.108	0.108	0.114	0.124	0.126	0.125	0.125	0.122	+
Yunnan	0.280	0.283	0.236	0.224	0.211	0.204	0.200	0.192	0.151	-
Anhui	0.045	0.068	0.073	0.096	0.105	0.114	0.125	0.129	0.152	+
Shandong	0.138	0.142	0.149	0.158	0.159	0.159	0.162	0.161	0.153	+
Liaoning	0.153	0.163	0.182	0.200	0.196	0.194	0.189	0.181	0.159	+
Hubei	0.092	0.095	0.108	0.115	0.118	0.122	0.126	0.133	0.161	+
Qinghai	0.161	0.167	0.157	0.128	0.126	0.127	0.130	0.132	0.171	+
Inner Mongolia	0.089	0.089	0.088	0.095	0.098	0.118	0.137	0.125	0.179	+
Heilongjiang	0.114	0.111	0.135	0.202	0.198	0.184	0.177	0.171	0.197	+
Ningxia	0.262	0.279	0.273	0.292	0.262	0.221	0.218	0.206	0.243	-
Jiangsu	0.169	0.170	0.169	0.173	0.180	0.190	0.225	0.232	0.244	+
Gansu	0.260	0.246	0.229	0.243	0.252	0.247	0.258	0.265	0.268	+
Guangdong	0.238	0.251	0.261	0.291	0.312	0.336	0.337	0.337	0.283	+
Xinjiang	0.266	0.224	0.304	0.282	0.291	0.296	0.302	0.325	0.353	+
Intra-Province	0.073	0.078	0.084	0.089	0.092	0.100	0.108	0.105	0.098	

Note: Ranking by the value of Theil index in 2005

Source: *Provincial Statistical Yearbooks from 1998 to 2006*

REFERENCES

Akita, T., R. A. Lukman, and Y. Yamada. 1999. Inequality in the Distribution of Household Expenditures in Indonesia: A Theil Decomposition Analysis. *The Developing Economies* XXXVII-2 (June): 197–221.

Barro, R. J., and X. Sala-i-Martin. 1995. *Economic Growth*. New York: McGraw Hill.

Bourguignon, F. 1979. Decomposable Income Inequality Measures. *Econometrica* 47(4), 901–920.

Cai, Fang, Dewen Wang, and Yang Du. 2002. Regional Disparity and Economic Growth in China: The Impact of Labor Market Distortions. China Economic Review 13: 197–212.

Cheng, B., and Yi Feng. 2000. Determinants of Economic Growth in China: Private Enterprise, Education, and Openness. China Economic Review 11: 1–15.

Dayal-Gulati, A., and A. M. Husain. 2000. Centripetal Forces in China's Economic Takeoff. *IMF Working Paper* 00/86.

Demurger, S. 2001. Infrastructure Development and Economic Growth: An Explanation for Regional Disparities in China. *Journal of Comparative Economics* 29(1): 95–117.

Demurger, S., J. Sachs, W. T. Woo, S. Bao, G. Ahang, and A. Mellinger. 2002. Geography, Economic Policy, and Regional Development in China. *Asian Economic Papers* 1(1): 146–197.

Hu, Huanyong. 1935. Population Distribution in China. *Acta Geographica Sinica* 2(2): 33–74. Reprinted in Hu, Huanyong.1983. *Arguments on the Population Distribution in China* (Shanghai: East China Normal University Press), 52–65.

Jian, T., J. Sachs, and A. Warner. 1996. Trends in Regional Inequality in China. *China Economic Review* 7(1): 1–21.

Kanbur, R. and X. Zhang. 1999. Which Regional Inequality? The Evolution of Rural Urban and Inland-Coastal Inequality in China from 1983 to 1995. *Journal of Comparative Economics* 27(4): 686–701.

Kanbur, R., and X. Zhang. 2005. Fifty Years of Regional Inequality in China: A Journey through Central Planning, Reform, and Openness. *Review of Development Economics* 9(1): 87–106.

Li, Shantong, Jie Feng, and Yongzhi Hou. 2004. Ten Major Trends for Regional Development in China. *China Development Review* 6(1): 89–93.

Lin, Yifu, and Mingxing Liu. 2003. Growth Convergence and Income Distribution in China. *The Journal of World Economy* (in Chinese) 26(8): 3–13.

Lin, Yifu, and Peilin Liu. 2003. Chinese Development Strategy and Economic Convergence. *Economic Research* (in Chinese) 20(3): 19–25.

Litwack, J. M., and Y. Qian. 1998. Balanced or Unbalanced Development: Special Economic Zones as Catalysts for Transition. *Journal of Comparative Economics* 26(1): 117–141.

Lu, Ming and Cheng, Zhao. 2004. Urbanization, Urban-Biased Economic Policies and Urban-Rural Inequality. *Economic Research* (in Chinese) 21(6): 50-58.

Peng, Guohua. 2005. Regional Divergence of Growth in China and Its Explanation. *The Journal of World Economy* (in Chinese) 28(9): 42–50.

Poncet, S. 2005. A Fragmented China: Measure and Determinants of Chinese Domestic Market Disintegration. *Review of International Economics* 13(3): 409–430.

Renard, M-F. 2002. A Pessimistic View on the Impact of Regional Inequalities. *China Economic Review* 13(4): 341–344.

Researching Group of National Bureau of Statistics of China. 2007. The Analysis of Disequilibrium of Regional Economic Development in China. *Economic Research* (in Chinese) 24(5): 48–53.

Shankar, Raja and A. Shah. 2003. Bridging the Economic Divide Within Countries: A Scorecard on the Performance of Regional Policies in Reducing Regional Income Disparities. *World Development* 31(8): 1421–1441.

Shorrocks, A.F. 1980. The Class of Additively Decomposable Inequality Measures. *Econometrica* 48(3): 613–625.

Theil, H. 1967. *Economics and Information Theory.* Amsterdam, Netherlands: North-Holland Publishing Company.

Wang, Guanghua. 2004. Accounting for Income Inequality in Rural China: A Regression Based Approach. *Economic Research* (in Chinese) 21(8): 117–126.

Wang, X, and G. Fan. 2004. Analysis on the Regional Disparity in China and the Influential Factors. *Economic Research* (in Chinese) 21(1): 33–43.

Wang, G. H, and O. X. Zhang. 2006. 1985–2002 Rural Income Disparity in China: Trend, Cause and Policy Implication. In *Regional Disparities in China*, edited by Anwar Shah, Chunli Shen, and Heng-fu Zou. Beijing: People Press.

Williamson, J. G. 1965. Regional Inequality and the Process of National Development: A Description of the Patterns. *Economic Development and Cultural Change* 13(4): 3–45.

Wu, Yanrui. 2002. Regional Disparities in China: An Alternative View. *International Journal of Social Economics* 29: 575–589.

Xu, Hui. 2000. Review on Exploration of Western Areas from the Angle of Evolution of the Developmental Strategy of Regional Economy. *Journal of Hunan Educational Institute* (in Chinese) 18(6): 16–21.

Xu, Z., and Shantong Li. 2006. Analysis on the Trend of Regional Income Disparity in China. *Economic Research* (in Chinese) 23(7): 106–116.

Yang, D. T., and H. Zhou. 1999. Rural-Urban Disparity and Sectoral Labor Allocation in China. *Journal of Development Studies* 35(3): 105–133.

Yao, S., and Z. Zhang. 2001. On Regional Inequality and Diverging Clubs: A Case Study of Contemporary China. *Journal of Comparative Economics* 29(3): 466–484.

Yang, D. T. 2002. What has Caused Regional Inequality in China? *China Economic Review* 13(4): 331–334.

Young, A. 2000. The Razor's Edge: Distortions and Incremental Reform in the People's Republic of China. *Quarterly Journal of Economics* 115(4): 1091–1135.

Zhu, Shouyin, et al. 2003. Researches on the Trial Reform of Rural Tax and Fees and Administrative Systems in Rural Areas. *Review of Economic Research* (in Chinese) 2003(40): 2-24

Zhu, N., and X. B. Luo. 2006. Urbanization Disparities in China and its Determinant Factors. In *Regional Disparities in China*, edited by Anwar Shah, Chunli Shen, and Heng-fu Zou. Beijing: People Press.